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NOTES ON BANDING BIRDS IN ANTARCTICA, AND ON THE ADELIE PENGUIN COLONIES OF THE ROSS SEA SECTOR

By OLIVER L. AUSTIN, JR.

In November 1955 I flew to Panama to catch the USS *Glacier* (AGB-4) as she transited the Canal on her way to Antarctica. Assigned to Operation Deep Freeze I as official Air Force observer, I was also authorized to collect zoological specimens for the U.S. National Museum and to band birds for the Fish and Wildlife Service, both strictly "on an opportunity basis." This meant that bird work must not in any way interfere with the primary objectives of the Operation—to establish the U.S. bases at McMurdo Sound and at Little America for the forthcoming International Geophysical Year (IGY) of 1957-1958—or with my own primary mission for the U.S. Air Force.

In the short 3 weeks between my unexpected assignment to the Operation and my flight to the ship, little planning for ornithological work was possible. I had barely time to assemble my collecting equipment and a stock of bands. The Patuxent office sent me 500 of each of the larger sizes of bands from #5 up, and 1,000 each of the smaller sizes. They also procured for me 100 of the tags used for marking seals in the Pribilofs and pliers for attaching them (these were flown from Alaska and reached me the day I left), and 100 smaller poultry wing tags and attaching pliers. Even this small amount of equipment, added to my clothing and cold weather gear, exceeded the generous extra weight allowance given me for the MATS flight to Panama, and to "make the weight" I had to jettison most of my ammunition before boarding the plane.

We entered the Ross Sea area at Scott Island on 15 December, and I spent the next 10 weeks carrying out my various assignments as the Operation's movements permitted between the Ross Ice Shelf, McMurdo Sound, and the Victoria Coast north to Cape Adare. Opportunities for bird work on a naval task force I learned are indeed limited. Seldom did any of the ships stop within reach of penguin colonies, and when they did bird study had too low a priority to be spared the transportation necessary to reach them. Nevertheless, thanks to a bit of luck and a fairly capable pair of legs, I managed to visit 5 of the 13 known Adelie Penguin colonies in the Ross Sea area, and to see 4 of the others from a distance. All told I was able to spend only 30 hours actually working in these colonies, during which I banded 500 Adelies (exhausting my size 9 bands), 84 Skuas, and 3 Giant Petrels, and put seal tags on the flippers of 87 more Adelies.

Since my return I have reviewed the literature on penguin banding —would that I had been able to do so before I went to Antarctica! It is widely scattered, much of it in publications of limited circulation and difficult to obtain. For that reason, and because my own observations are more pertinent in the light of what others have done, I present the following resume of previous efforts to mark penguins.

HISTORY OF PENGUIN MARKING

In his charming though fanciful tale, "Rik: the Story of a Penguin," Frank Debenham (1952: 77-95) describes how James Murray, the biologist on Shackleton's British Antarctic Expedition of 1907-09, assisted by geologist Raymond Priestley, marked a newly hatched Adelie chick in December 1908 at Cape Royds, McMurdo Sound, by nipping off "a tiny piece of claw and [putting] a tiny ring of celluloid on his leg." This enabled Priestley (according to the story) to recognize the bird when he found it 3 years later killed by an avalanche at Ridley Beach, Cape Adare, 500 miles away. Were this true, Murray and Priestley would have been the first to mark penguins, but Mr. Debenham has confessed to me *(in lit.)* that "this is the only part of the story which is fictional. . . . I had to have Rik ringed and rediscovered by Priestley because otherwise he couldn't have recognized him and the human interest in the story would have been lost."

Actually the first penguins ever banded were the 50 Gentoos *(Pygoscelis papua)* that L. Gain (1914: 501), zoologist of the Second French Antarctic Expedition, marked 28 December 1908 on islands off the Palmer Peninsula, by putting green celluloid bands on their tarsi. On 12 January 1909 in another colony near by, Gain banded 40 more Gentoos and 50 adult and 75 young Adelie Penguins *(Pygoscelis adeliae)*. When Gain visited the same colonies the following breeding season, he found enough of the marked adults to determine that both species return to the same place to breed in successive years. As he found none of the young he had banded, he deduced "it appears that the young birds do not return to their birthplace and do not breed before two years old."

The next person to mark penguins for individual identification was G. Murray Levick, physician with Scott's northern party of 1911-12 and author of a now classic account of penguin behavior (1914). In his formal report on the Adelie Penguins at Ridley Beach (1915: 61) Levick writes: "With red paint I marked the breasts of a good many couples, renewing the paint as it faded, through the whole breeding season, and in every case the couples remained perfectly faithful to one another."

Field work on penguins then lagged for a quarter of a century, until L. E. Richdale began his monumental studies of the three New Zealand species in 1936. Richdale (1951: 47-54) was the first to report the difficulties in using the banding method on this group of birds, and the first to try to overcome them. He found, as have later workers, that tarsus-ringing is not entirely satisfactory with any of the Spheniscifformes, and is moderately successful only with the smaller species. Their tarsi are all exceedingly short, too short to accommodate a band of "standard" width. As most penguins either

walk or rest on the tarsus as well as on the phalanges, a tarsus band is subjected to abnormal wear, and often becomes so jammed and bent that it injures the leg. A band placed above the tarsus on the tibia, though less likely to hurt the bird, is so hidden by feathers it cannot be seen until the bird is examined in the hand.

In experimenting with several materials, types, and sizes of bands, Richdale soon discarded celluloid rings because they come off too easily. The heaviest aluminum bands he was able to procure (comparable to our size 9) he found serviceable on the tarsus for only 2 to 5 years. For a more permanent marking scheme he devised the technique of punching holes in the webs of the feet in recognizable patterns. These methods sufficed for Richdale's particular studies, which never involved large numbers of birds.

No one else tried to band or mark penguins until interest in the Antarctic revived at the end of World War II. Several groups of investigators then attacked the problem simultaneously in widely separated parts of the Antarctic and sub-Antarctic: J. D. Andrew, J. M. Roberts, W. J. L. Sladen, and B. Stonehouse of the Falkland Islands Dependencies Survey (FIDS) in the Palmer Peninsula region; J. Sapin-Jaloustre, J. Cendron, and J. Prevost with the French Antarctic Expeditions in Adelie Land; and M. C. Downes, A. M. Gwynn, and J. B. Sturrock with the Australian National Antarctic Research Expeditions (ANARE) at Heard and Macquarie Islands. For several years each of these groups worked independently, without knowledge of the accomplishments of the others. It is interesting to note how closely their efforts and their results parallel one another.

The postwar work started in February 1945 when G. J. Lockley, a FIDS biologist, banded 50 young Gentoos at Port Lockroy, Palmer Peninsula. In November 1946 Andrew (Andrew and Roberts, 1952: 540) banded 10 pairs of Adelies on their nests (which he also marked) at Hope Bay, also in the Palmer Peninsula. The Hope Bay colony was studied during the next two breeding seasons first by J. M. Roberts, then by W. J. L. Sladen. The results corroborated some of Gain's earlier findings, in that six pairs returned to lay at the identical sites the following year and four pairs the next. Unexpected was finding that several of the marked pairs had split up, one bird returning to the old nest with a new mate, its original partner returning to nest close by, also with a new mate.

All these birds were banded with rings made in the field of strips of sheet aluminum marked with a set of number punches, and fastened around the feathered tibia. Sladen at first tried Richdale's technique of tarsus-banding, but immediately shifted to the tibia when he found that bands on the tarsus abraded rapidly and injured the birds. Sladen (1952: 542) reports that Adelies banded on the tibia in 1946 "were still in excellent condition" when he recovered them in 1948. In January 1950 at Port Lockroy Sladen found one of the young Gentoos banded there in 1945: "The ring was in excellent condition and the number '47' could be clearly read."

Sladen brought with him in 1948 a new stock of numbered bands of a special aluminum alloy and marked "Inform FIDS Colonial Office

London." The size 6 used for penguins then was supplied in strips of 18 standard wire gage metal, 4½ inches long and 12.5 mm. wide. The strips were trimmed to fit the particular bird and fastened by a clip over the ends. The inscription and reference number were duplicated inside the double bend of the clip as a safeguard against abrasion of the outer markings.

To identify penguins at a distance, Sladen experimented with paints and colored celluloid rings. He found painting highly successful for a single breeding season. Using a quick-drying cellulose aircraft paint developed for low temperature work, numbers painted on the back of the flipper where "the feathers are short, dense and usually clean . . . could be read after the bird had been at sea for ten days." "It was essential . . . to postpone painting if the flipper was wet or dirty. . . . Yellow was the best colour."

The colored celluloid rings gave poor results used on the legs. On the tarsus they injured the leg almost as badly as metal rings did; on the tibia they could not be seen. Placed on the base of the flipper, the ring was usually lost when the bird went to sea. Sladen reports them useful only for marking birds temporarily on the flipper when wet weather prevents painting, for marking fasting or molting adults (which stay out of the water), and for the larger chicks. Smaller chicks he identified with soft string tied to the flipper, which he loosened as the chick grew.

Sladen was the first to experiment with metal rings at the base of the flipper, where they are not subject to wear and are readily observable. He warns that attaching them requires meticulous care, but put on correctly they "rub only the short feathers at one place on the thin anterior edge of the flipper." He flipper-ringed some 530 birds in the 1950-51 season and followed some of these successfully throughout the nesting and molt. He informs me *(in lit.)* that some of these rings were reported still in good condition 3 years later.

Roberts and Sladen (1952: 540) also report the banding of some Emperor Penguins *(Aptenodytes forsteri)* in June 1949 by B. Stonehouse on the newly discovered breeding ground on Dion Island, Marguerite Bay, "but owing to lack of suitable material, the rings were only temporary."

The French started banding penguins in Adelie Land on the opposite side of the continent in February 1950. The first report of it published (Sapin-Jaloustre and Bourliere, 1951: 66) states only that Sapin-Jaloustre marked a number of adult and young Adelies with oil paints, which proved far more useful for identification during the season than metal or celluloid bands on the legs, and that just before leaving in January 1951 he experimented with metal bands on the flipper, which held great promise. Later Sapin-Jaloustre (1952-A: 81) gave a more detailed report on his activities during the 1950-1951 season. In February 1950 he marked 75 young Adelies (presumably on the tarsus, though he fails to say), but found "The regular aluminum bands are invisible on the adult's tarsus. Also many have caused accidents from compression, owing no doubt to the dorsal flexion of the foot, and had to be removed. A system of banding on the wing,

extremely visible, was tried, and so far appears to give excellent results. Taking into account the bands removed and birds killed by the dogs, 64 adults remained banded for later observation."

A photo accompanying this report shows an adult Adelie with an aluminum band clipped around the axillary part of the flipper in such a way that it is certain to interfere seriously with the bird's progress in the water.

This same report (p. 82) announces the exciting discovery of the large Emperor Penguin colony at Pointe Geologie and states: "70 Emperors and 10 young were banded with improvised means; 24 adults with aluminum bands made and marked at the base, all the bands which had been brought being much too small." In a later report (1952-B: 181) Sapin-Jaloustre gives the following breakdown of this banding, all birds banded on the right tarsus: Pointe Geologie 16 October 1950, 10 adults with aluminum bands marked AA to AJ, 9 young with celluloid bands, 40 adults with tarred waterproof cord knotted around the right tarsus; Port Martin 27 October 1950, 1 adult with aluminum; below Terra Nova Glacier 28 November 1950, 6 adults with aluminum.

When Sapin-Jaloustre left Adelie Land early in 1951, his place as physician and biologist at Port Martin was taken by his compatriot, Jean Cendron, who reports (1952: 50) the following banding during his year there: 20 adult Emperors wing-banded 1 June 1951 and about 75 more adults and 40 young wing-banded in September, all at Pointe Geologie; about 40 adults and 50 young Adelies wing-banded at Port Martin in February and March 1951. Between October 1951 and January 1952 he banded the 200 adult Adelies occupying 100 new marked nests, and states a "certain number" of the birds banded the previous year were found nesting, but the destruction of the birds by dogs interfered seriously with the study.

In the report of his study of the Adelie's molt that year, Cendron tells (1953: 79) of marking some 30 adults "on the upper breast with simple geometric figures in bright colors of quick-drying, water-resistant paint [made by the Duco company]. Each bird was thus easily recognizable as long as its breast and neck feathers had not fallen; to avoid losing a bird, at the start of the molt we placed at the base of the wing an aluminum band of the Paris Museum bearing an easily visible number. After we followed the entire molt of a bird, we killed it to determine its sex." Of the 30 birds originally marked, the study was completed on only 3.

The next year Cendron's place as surgeon to the French expedition was taken by Jean Prevost, who spent the winter of 1952 studying the Emperors at Pointe Geologie. In the expedition report for that year Prevost (1954: 16) comments on his banding: "The banding of Emperor Penguins was from the start a source of disappointment; the model of 'Museum' bands we had soon proved useless for our rookery studies. The very dense grouping of the birds made necessary a marking clear and visible at a distance. After a number of tries (painting the backs, strips of numbered plywood fixed to the flipper) a model of ring perfected on the spot with the help of Roger Vincent

gave us complete satisfaction." Some of Prevost's banding difficulties and his success in spite of them are described in the very readable account of that expedition by its leader (Marett, 1955). The 250 Emperors he marked were instrumental in obtaining for Prevost some of the most important and unexpected observations he made on the species' behavior and life history (1953 and 1955).

How well their flipper bands lasted, and what effect they may have had on the Adelies and the Emperors after they left the breeding grounds, the French ornithologists have not yet reported.

While the French were working in Adelie Land, the Australians were experimenting along similar lines at Heard Island, 2,500 miles to the westward. Chittleborough and Ealy (1950: 102) did the first banding there in 1949, and ringed some 4,000 birds of 10 species, but evidently had no bands suitable for penguins. M. C. Downes (1955: 1) started experimenting with the Gentoos, Rockhoppers *(Eudyptes crestatus)* and Macaronis *(E. chrysolophus)* there in 1951. He first tried ear tags used for marking sheep in Australia, aluminum strips 6.5 mm. wide and 1.4 mm. thick with rounded edges, which "were easily wrapped round the legs of penguins and remained in position by their own tension. In every recovery, however, the flesh beneath was found to be inflamed, and the use of these bands on the legs is not recommended."

Downes found punching combinations of differently shaped holes in the webs of the feet with a leather punch "to be a great success." He also tattooed the webs with a large pair of pliers fitted with sharp pins in the shape of figures or letters which "punctured the web . . . leaving behind sets of small holes into which a greasy dye was rubbed." When the birds were in a suitable position the tattoos were recognizable from a distance, and "two years later the punch marks were still easily visible but the tattoed figures could not be read unless the bird was handled."

In 1953 Gwynn (1955: 8) obtained flipper bands from Sladen to try at Heard Island, and Sturrock used them simultaneously at Macquarie. They proved unsatisfactory when used on Rockhoppers. Of seven tagged 1 May at Heard Island just before the birds left for the winter, only one was found later, at its nest the following November. "The hind web of the flipper was denuded to the bare skin right into the axilla but the skin was not broken, and the leading edge of the flipper was badly notched. The ring was removed."

The 330 Rockhoppers Sturrock flipper-banded at Macquarie that April "included almost the entire population of a small colony close to the A.N.A.R.E. Station. Finding the same difficulty as that experienced by the writer [Gwynn, idem] in fitting the clip in the axilla, Sturrock placed the clip on the outer (dorsal) aspect of the flipper, projecting vertically upwards. The result was disastrous. Only 35 birds appeared for the breeding season all showing serious abrasions around the base of the flipper. . . . A few with only slight abrasions returned with the main body, but there appeared to be a correlation between the severity of their injuries and the lateness of their return.

However, a further 147 returned for their moult in the following April, having missed the breeding season altogether."

A narrower band made of strip aluminum 6.5 mm. wide and strong enough to be overlapped without a clip gave slightly better results. Three of the six so tagged in May were recovered the following November; each showed notching on the anterior edge of the flipper and the axillary wear "is only seen after the long winter at sea, and it is possible that in pelagic species, such as the macaroni and rockhopper penguin, wear is worse than in those species which spend the intervals between fishing on land or on ice-floes. Sladen was working with species which probably spend much of their time at all seasons resting on the packice (Adelies)." Gwynn concludes "flipper banding is eminently suitable for a single season's work, but the technique requires further modification before it can be recommended as a method of marking for long-term research."

Of the difficulties reported by the Australians, Sladen has written me as follows: "The trouble with these flipper rings is that unless they are put on exactly right they are dangerous. Reading the Australian account, they seem to have put the clip on incorrectly, and *failed to bend it back* flush with the rest of the ring. A clip projecting into the axilla or anywhere else is bound to cause damage. Our new FIDS design and that of the Australians is of thicker metal with a simple overlap. We are experimenting with new methods and hope soon to publish the results, but one of the difficulties with antarctic work is the long time lag between time and result and publication."

BANDING ADELIE PENGUINS ON DEEP FREEZE I.

In addition to my supply of F&WS bands, as noted previously, I had with me 100 each of two sizes of tags that I hoped could be attached to penguin flippers and possibly solve the problem of marking these birds harmlessly, conspicuously, and permanently. These tags are manufactured in several sizes by the National Band and Tag Company of Newport, Kentucky, primarily for ear-marking livestock and wing-marking poultry. They consist of a flat strip of metal bent midway into a U-shape, with a pointed staple on one open end and a matching slot on the other. They are affixed with a special pair of pliers that forces the staple through the ear or wing and clamps its point fast in the opposing slot.

The larger tags, which I thought might do for Emperors, are the cattle ear tags the Fish and Wildlife Service has used so successfully on fur seal flippers in the Pribilofs. Made of 3/8″ x 3 3/8″ strips of a hard, 20-gage, Monel nickel-copper alloy, when locked into place they are 1½″ long with a 3/8″ gap between the sides. For the smaller Adelies the Banding Office obtained for me the "Jiffy" tags made for wing-tagging poultry. These are of softer metal, 3/16″ wide, and when closed are ¾″ long with a 3/16″ slot for the wing.

My first opportunity to test this equipment came 18 December when *Glacier* stopped for 2 days in the heavy bay ice of McMurdo Sound, about 2½ miles offshore of the southernmost of the three Adelie colonies just inside Cape Bird (no. 12 on map, p. 17). The Adelies

in this colony were incubating very closely, and their eggs were just hatching. Almost every bird I looked under had either newly hatched young or eggs just pipping. The oldest young I saw appeared to be no more than 4 or 5 days old.

From the time they lay their eggs in mid-November the Adelies almost never leave their nests uncovered until the chicks are 12 to 14 days old. Both sexes share the incubation in turn through the 32- to 34-day incubation period (Sladen, 1955), each bird incubating for 10 to 14 days at a time, and neither leaves the nest until relieved by its mate. The reason for this is twofold, first for warmth (temperatures during my visit ranged from 12° to 35° F.), second and even more essential, to protect the eggs and young from the ever-watchful predatory Skuas.

As you walk among the nesting Adelies, the brooding birds express their resentment by squawking at your approach, but do not budge until you get within reach of their bills. Then, without moving their bodies from the nest, they twist their necks to peck at you, and desist the moment you step out of range. In every group, however, are usually a few adults that have not mated, or who have lost their eggs, but are still guarding the territories they established weeks before. These birds make things rather uncomfortable for the intruder. They rush at you fiercely as you near their sterile territory, bite your legs as far up as they can reach (they nip sharply enough to hurt through several layers of clothing), and bang your shins with rapid, drumming blows of their flippers, which can also be surprisingly painful.

As soon as I had familiarized myself somewhat with the colony and its inhabitants, I started tagging and banding. Having no way to mark permanently the nests of the birds I handled, I restricted these operations to the two clusters of nests on the extreme southern periphery of the colony. In the smaller southeasternmost group I wing-tagged 53 nesting adults. In the larger knot of nests marking the southwest corner of the colony at the edge of the bank above the shore, I banded 500 adults on the right tibia.

The wing tags, it seemed to me, would be least likely to injure the birds or to interfere with their swimming powers if affixed to the trailing (posterior) edge of the flipper slightly outboard of the midpoint, where a bone- and muscle-free spot extends inward about an inch from the edge. It takes a bit of experimenting and practice to locate this spot, but a tag can be clipped through the flipper there with ease, and apparently without causing the bird any discomfort.

Not a single one of the penguins I tagged showed any evidence of being hurt by the process. None flinched in the slightest as the point bit through the flesh, or gave any other sign of noticing it. Unlike many land birds whose first reaction on being released after banding is to fly to a nearby branch and pick at the band, none of the penguins I tagged paid any attention to the clip in its wing. The moment I released it, each bird immediately settled back on its nest and resumed incubating contentedly and unconcernedly.

I first tried the small "Jiffy" poultry tags but, contrary to expectations, they proved much too small for the Adelies. They fit the flipper

so tightly when locked into place that they are almost certain to interfere with the molt. Secondly they are so inconspicuous that they are not likely to be noticed if the bird is more than a few yards away. Lastly they do not open widely enough to be slipped into place easily against the grain of the small but very stiff feathers covering the flipper. With much trouble and fiddling I did manage to get three of them locked in place, ruining 10 tags in the process, before I concluded they are just not suitable.

I next experimented with the seal tags. While not perfect for the Adelies, they can be used with more success than the "Jiffy" tags. They should be quite suitable for Emperors, on which unfortunately I did not have a chance to try them. The slot allows ample room for the molt, and for the Adelies it could possibly be a trifle shallower. The tag shows up well at a distance, but if it were slightly wider, say by 1/8", it would be even more conspicuous and would accommodate a larger legend, easier to read without picking up the bird. Its main fault for use with Adelies is its length; were it 1/4" to 5/16" shorter it would fit more snugly. If affixed to allow the ideal space of about 1/8" to 1/4" between the end of the slot and the edge of the flipper, the staple is likely to strike a blood vessel or one of the phalanges. Even a small bone will deflect the point of the staple so it misses the locking slot. Tags so twisted cannot be repaired in the field and must be discarded.

In tagging the 50-bird sample I ruined 10 tags, a few by striking bone, most by not having the clip squarely in the jaws of the pliers before pressing the point home. Squeezing the Monel clip into place takes quite a bit of strength and is difficult to do with one hand. Pliers with better leverage to give more jaw pressure would facilitate the task for the lone operator who must hold the bird in one hand while tagging it with the other.

In 5 of the 50 birds I punctured a small blood vessel, which bled enough in the few minutes before clotting stopped the flow to stain a spot an inch or two in diameter on their white waistcoats. Neither the bleeding birds nor their companions paid the slightest attention to the disfigurement. None of the remaining 45 birds bled a drop.

After tagging the 50, which I decided was enough for an experimental sample, I turned to conventional leg banding. Here I found, as others had before me, that an Adelie's tarsus is indeed far too short to accommodate the width of our bands. Furthermore, the tarsus has a pad on its posterior side like those on the toes. So I placed the bands above the joint at the base of the tibia where, though the band is partly hidden by feathers, the size 9 fits just about right. Size 8 is too small.

I soon worked out a practicable method of handling these strong, heavy birds. The adult Adelie weighs between 10 and 15 pounds, depending on how long it has been fasting, and is far too strong and lively for a lone bander to pick up and hold under one arm while he bands with the other, as one does a gull or a duck. The easiest way is not to pick the brooding birds up at all, but to hold them down and band or tag them right on the nest: Approach the

bird from the front, place the left knee on the ground at the left side of its head and lower the left forearm firmly on its shoulder, being careful to avoid pressing the middle or lower back which might crush eggs or young. This keeps the bird's head with its sharp beak out of damaging distance behind your elbow, and leaves your left hand free to hold the flipper or leg still while you tag or band it with your right.

At first the banding went slowly, and took a full minute or more per bird, but as facility with the technique improved, so did the speed. Not counting the time spent opening bands, I put the last 200 bands on in a few minutes less than 2 hours. However, the next time I band for any length of time in an Adelie colony, I hope to be wearing hip length boots or coveralls well lined with crumpled newspaper to absorb the hammering of the flippers, and a heavy leather glove with long gauntlets tied above the elbow on my left arm to soften the pinching of the sharp beaks. I carried the bruises, bites, and scratches from that one day's work on both legs and on my left forearm for a good 2 weeks. Fun though it is to work with Adelies, their defensive capabilities are not to be underestimated when handling them in quantity at close quarters.

I kept my 40 remaining seal tags hoping to try them on Emperors, but the few that straggled over the ice into McMurdo Sound that season were rounded up as fast as they appeared for the Washington Zoo. (Of the 20-odd Emperors that started the voyage back, the three that survived it all died of respiratory infections within a week after reaching the zoo.) I encountered no other Emperors I could get my hands on elsewhere in my travels so, when chance offered on 26 January, I used the tags to mark a sample of Adelies in the southernmost penguin colony known, adjoining Shackleton's famous hut at Cape Royds (no. 13 on map, p. 17).

Here I again tagged only adults, but that late in the season with the chicks well grown, the comparatively few adults present were not occupying definite territories. While they were doubtless members of the Cape Royds population, there is no assurance that the birds I tagged had nested at the southern edge of the colony where I caught them. They were very active, and not nearly as easy to catch or to handle as the incubating birds had been. Fortunately I had an enthusiastic and willing machinist's mate, one Mike Flannigan of Jersey City, to help me and, with a dip net to pick up the birds, we used up the remaining tags in about an hour. Six of the 40 tags bent out of shape or blunted while being attached, so the Cape Royds sample is 34, all tagged as were those at Cape Bird, on the trailing edge of the right flipper.

I hope someone based at Hut Point with the Navy and IGY parties to be there during the next two breeding seasons will find time to spare from geophysical observations and be able to travel to Cape Royds and Cape Bird (20 and 42 miles distant respectively), to see how many of these marked birds have survived, and what effect if any the tags have had on their flippers.

BANDING SKUAS

An active program of banding Skuas (*Catharacta skua,* known to all antarctic hands as "skuagulls") is certain to yield more important and spectacular results than banding any of the other five species of birds that breed in Antarctica. Four of these species, the Emperor and Adelie Penguins, the Antarctic Petrel *(Thallasoica antarctica),* and the Snowy Petrel *(Pagodroma nivea)* seldom move north of the pack ice and, until the Antarctic is far more densely peopled, have little chance of being recovered away from their breeding grounds. Though Wilson's Petrel *(Oceanites oceanicus)* migrates long distances into northern seas, it is a small bird that remains far at sea there and seldom falls into human hands. It would be difficult to band enough of them in Antarctica to assure any chances of recovery.

The Skuas of the Antarctic, however, can be banded easily in fair quantities, and they wander northward during the antarctic winter to waters and shores where they come frequently into contact with mankind. They present a number of distributional, systematic, and behavior problems that warrant further study, and only through banding them on their breeding grounds can the movements and moot relationships of the several recognized forms to one another be determined.

Practically no two recent authors agree in their systematic treatment of the forms of the bipolar genus *Catharacta.* Some regard its antarctic representatives as specifically distinct from the Great Skua of the North Atlantic. As none of the morphologically distinguishable forms has as yet been proved to breed sympatrically with any other, the conservative view is to regard the genus as monotypic, and its single species, *C. skua,* to be divisible into at least four acceptable subspecies, *skua, chilensis, lönnbergi,* and *maccormicki.* Banding evidence of their movements based on breeding ground banding will help greatly to clarify their relationships.

C. s. maccormicki is a common breeding bird throughout coastal Antarctica, and frequently strays far inland. Skuas soon gather around human activities in the antarctic summer looking for food, and will stay for some time wherever anything edible seems obtainable. They are fairly tame and bold, and present no problem to the experienced bird trapper who has material for traps, nets, or snares handy, a supply of bait, and time to devote to catching them. Where seals are plentiful for bait, trapping Skuas in quantity, say 20 or so at a time, should be simple with any type of throw net. The easiest and most profitable place to band them is at their nests.

Single pairs of Skuas nest in widely scattered places, on almost any islet or headland near open water. One isolated pair was nesting on the scree under Observation Hill at Hut Point when the Seabees started building Williams Air Facility there. The birds were successful despite the bustle of human activity near-by, and I banded their two young when they were almost ready to fly on January 30th. These are undoubtedly the two southernmost birds banded to date (77° 53′ S.), a record I hope will soon be broken.

Wherever food is plentiful enough, Skuas nest in loose, colonial fashion. I will be greatly surprised if a number of pairs do not nest next December near the garbage dump of Williams Air Facility. The most abundant and unfailing sources of Skua food in the Antarctic, however, are the Adelie Penguin colonies. Every Adelie colony in the Ross Sea area has Skuas parasitic upon it. They nest around its fringes, usually in the ratio of about 1 pair of Skuas to 100 or so pairs of penguins. Though this ratio may vary somewhat from place to place, nevertheless the number of Skuas attendant on an Adelie colony is often a rough index to the size of the Adelie population, and is much easier to count.

The Skuas nest somewhat later than the Adelies, and usually lay just as the Adelie eggs start to hatch. On 18 December at the Cape Bird colony, many of the some 175-200 Skua nests in the vicinity contained only the first of their standard clutch of two eggs. Twenty days later on January 7 at Cape Royds, only three young had hatched in the 18 Skua nests I found there. As I could find neither eggs nor young in the territories being guarded by six more pairs of Skuas near Shackleton's hut, I feel sure their nests were destroyed by some of the many Deep Freeze I visitors to the famous site. Everybody loves the Adelies and hates the Skuas for preying on them. Likewise the uninitiated resent the Skuas' habit of dive-bombing intruders on their territory. So they feel quite justified in breaking up any Skua nest they find, despite strict Task Force orders forbidding them to molest any indigenous wildlife.

When I reached Cape Royds again 26 January, I was pleased to find all three of the young I had banded 19 days before, now more than half grown. I found only 7 other young (which I banded of course), and one nest containing two eggs and six with a single egg still being incubated. As the single-egg nests had no young near-by, they were probably renestings of pairs whose eggs had been destroyed earlier. Their chances of maturing chicks were doomed to failure. When not interfered with, some young Skuas are on the wing by the end of January, and all that are going to survive are flying by the end of February. The freeze-up starts in earnest March 1.

Nesting Skuas, while remarkably tame compared to nesting gulls elsewhere in the world, are not as tame as the penguins, which will not leave their nests when approached. A nesting Skua sits quietly until you are within about 50 feet. Then it starts to cackle in alarm—"ha-ha-ha-ha-ha." When you walk within 25 feet the incubating bird gets up, still cackling, stalks uncertainly away from the nest, and is usually joined at once by its mate who has been sitting a few yards off. The two birds walk stiffly and hesitatingly away, cackling the while, and raise their wings uneasily, the signal they are about to fly. Taking wing they circle about and, as you reach the nest, dive threateningly at you, veering off within a foot or so of your head. Of the dozens of Skuas that swooped at me, however, not a single one actually struck me.

At Cape Bird I had no way of catching adult Skuas, but before I went to Cape Royds 7 January I was able to borrow from a hydrogra-

pher friend aboard *Glacier* the ideal implement for the purpose, a "Dura-Flote" net. This net has an ample 2-inch mesh bag on a light, circular, duralumin frame 2 feet in diameter with a 4-foot duralumin handle. Armed with this weapon, I approached the first nest warily. On the first bird's first pass at me I swung the net and took it right out of the air, and a few moments later its persistent mate. In the scant 2 hours I had there before the helicopter came to take me back to the ship, I caught both adults on three nests and one of the pair on three more, nine birds in all.

I soon found individual birds differ in their boldness. The boldest are those whose eggs are just hatching, or who have newly hatched young in the nest. These zoom at you time after time, and come within 2 or 3 feet of your head. They are deceptively quick and, unless you swing the net fast and time the swing just right, will brake suddenly "with all flaps down" and soar up over it. A miss makes them more cautious. The surest way to catch them I found was to crouch down beside the nest with the net behind me and, as the bird swooped, to straighten up into its path at the last possible moment and swing at the same time. (And it's lots of fun, believe me!)

The Skuas' loyalty is strongest evidently to their territory. They lose their ferocity as the chicks grow and wander away from the nest. When I visited the colony at Edisto Acres (no. 4) on 12 February, the young Skuas there were well grown, some of them on the wing. I caught and banded 52 of the young, but only 10 of the adults zoomed close enough for me to net them. When I stood over a chick, or even held it up squealing in distress, the parents usually made a half-hearted pass or two, veering off at 10 or 15 feet, and then more or less lost interest. When on 18 February I finally got ashore on the largest Adelie colony in the Ross Sea area, the tremendous one on Ross Island west of Cape Crozier (no. 9), most of the penguins had left, the young Skuas were almost all flying, the adults kept their distance, and I couldn't catch a single bird.

My Skua banding for the season totalled 19 adults and 64 young, 83 in all. With enough time at the right time in the larger colonies, it should be possible to band Skuas by the hundred, perhaps by the thousand at the Cape Crozier breeding ground. They will take a size 6 band, but a size 7A is a better fit.

BANDING GIANT PETRELS

The only other birds I was able to band on Deep Freeze I were three Giant Petrels *(Macronectes giganteus)* I caught at Edisto Acres. The Giant Petrel is an unlovely bird, not as graceful as the albatrosses in flight, and even more awkward and ungainly on land. Close at hand it has an unpleasant, almost vulturine aspect, and I like the sailors' names of "Nelly" or "Stinker" for it; the latter inelegance is particularly fitting.

The Giant Petrel is not known to nest on the mainland of Antarctica in the Ross Sea sector, but small numbers visit the more northerly Adelie colonies in summer to share the pillaging with the Skuas. As we skirted Ridley Beach in a landing craft trying in vain to effect a landing through vicious surf kicked up by a 50-knot gale 9 February

(see p. 19), I counted 52 Nellies on the point just above the wave wash, 6 of them almost pure white, the rest dark. Ashore at Edisto Acres a week later, I found a dozen along the beach and a flock of 22 resting on the ice of the lagoon enclosed at its base. It was one of these rarities in late summer Antarctica, a calm day, and like the rest of the larger Tubinares, Giant Petrels have trouble taking wing without the help of a strong wind, especially when heavy with food. On the water they sometimes have to patter several hundred yards over the surface to get up flying speed. On land they lumber awkwardly ahead of you holding their wings outstretched but motionless, and often vomit their last meal in panic to "lighten ship."

The Nellies along the beach at Edisto Acres scrambled down into the water as I approached and quickly swam out of reach. Those on the lagoon ice couldn't find sanctuary as quickly. They waddled in a column to the steep talus at the base of the cliff behind the lagoon and climbed it laboriously to a precipitous spot. Then they turned and came swooping down past me as gravity increased their speed and their extended wings gained lifting power. I managed to run down three of these before they could get airborne. The rest were too fast for me.

Again with time and equipment—say a corral of netting to drive them into—and a bit of luck in the way of calm weather, these birds could be caught in some numbers for banding. And as the FIDS banding at the South Orkneys and Australian banding at Heard and Macquarie Islands have shown, a fairly high rate of recovery can be anticipated. Their possible circumpolar migration down the prevailing westerlies still wants further documenting and verification which only banding can supply. They take a size 8 band.

THE ROSS SEA ADELIE PENGUIN COLONIES

The saucy, impudent, inquisitive, and altogether fascinating Adelie Penguin is one of the most abundant birds in Antarctica. As such it is important as a reservoir of human survival food in that barren land which is just emerging from the ice age. Wise explorers of the past, no matter how well their expeditions were provisioned, established their bases near an Adelie colony when they could, the surest source of easily harvestable sustenance in time of emergency. Easy access to such a colony has given a welcome change of diet to many explorers, and on more than one occasion has been a decisive factor in their survival. It is unlikely that the Adelies will ever be of economic importance in any other way.

More than a century ago Ross suggested the possibility of shipping guano from these colonies to Australia (see p. 20). The depth of the guano beds under the Adelie colonies is unknown, but it is probably not very great. Many of the birds nest on steep slopes of bedrock where little guano can collect, and nobody has ever dug into the level sites below the permafrost, only a foot or two down. The deposits are undoubtedly high in nitrogen content, for there has been little bacterial action over the ages on the mass of excreta and innumerable penguin mummies of uncertain age, and on the rare days when the

temperature rises above freezing the stench of fresh ammonia is almost overpowering. But the deposits are so inextricably mixed with pebbles and boulders that they probably can never be mined profitably. So far this potential resource remains unexploited, and it is to be hoped nobody will ever be foolish enough to attempt it. The deposits could be worked only during the short summer when the birds are nesting—which of course would mean the end of the birds.

Esthetically and scientifically the Adelie is a priceless asset, an integral part of the antarctic scene whose presence would be sorely missed were the species not protected and maintained. For the ornithologist fortunate enough to be able to spend more than a few brief hours with them, the possibilities for research are unlimited, and the nesting birds' lack of fear of man makes them unbelievably easy to work with. Activities during the coming International Geophysical Year and, it is to be hoped, continued occupation of its station sites thereafter, will afford marvelous opportunities to increase our knowledge of these comparatively little-known birds.

The recent studies of Sladen, Sapin-Jaloustre, and others (see bibliography) have laid a fine groundwork for further investigations into the Adelie's biology, particularly its nesting habits and behavior. Much still needs to be done on its physiology, to explain its marvelous ability to fast for weeks at a time during the breeding season, and to regain its lost weight so rapidly. The species is an almost ideal subject for studies on the mechanics of adaptation of homoiothermic animals to cold.

One of the most promising fields for research on the Adelie, and one which so far has hardly been touched, is its demography. We know next to nothing of its individual life span, or of the rate of mortality in either the young (which all observers agree is very high) or the adults. With its low reproductive potential (one young per year for each breeding adult), the certainty that the species does not breed in its second summer and the strong probability that some individuals may not until their fourth or fifth, and the terrific observed mortality in the egg and nestling stages, the potential life span of the breeding adults must be very long, certainly longer than in any species we have yet been able to measure satisfactorily. A systematic banding or tagging program in a rookery convenient to one of the IGY sites over the next few years, particularly one that may be occupied on a permanent basis, could yield much information on these important aspects of the species' biology.

Its present abundance despite its low rate of recruitment shows the Adelie to be well adapted to its rigorous and forbidding environment. The ecological factors that govern its choice of nesting ground have not been satisfactorily determined. The Skua is its only enemy on land, other than man, and food is no problem for it anywhere within reach of Antarctica's krill-rich waters. The Adelie favors several types of terrain for its colonies, but despite statements in the literature to the effect that it occupies almost all the available sites, wide stretches of unoccupied ice-free coast appear quite suitable to its nesting needs. From the apparent antiquity of its known nesting sites, several of

which have been occupied more than a century, and the scant banding evidence, site tenacity is strong in the species. Whether or not this and other facets of its behavior pattern are so strongly ingrained they cannot change in case of need remains to be seen. Despite its abundance it does not seem to be increasing in numbers, and is apparently just maintaining a precarious state of balance which could easily be upset.

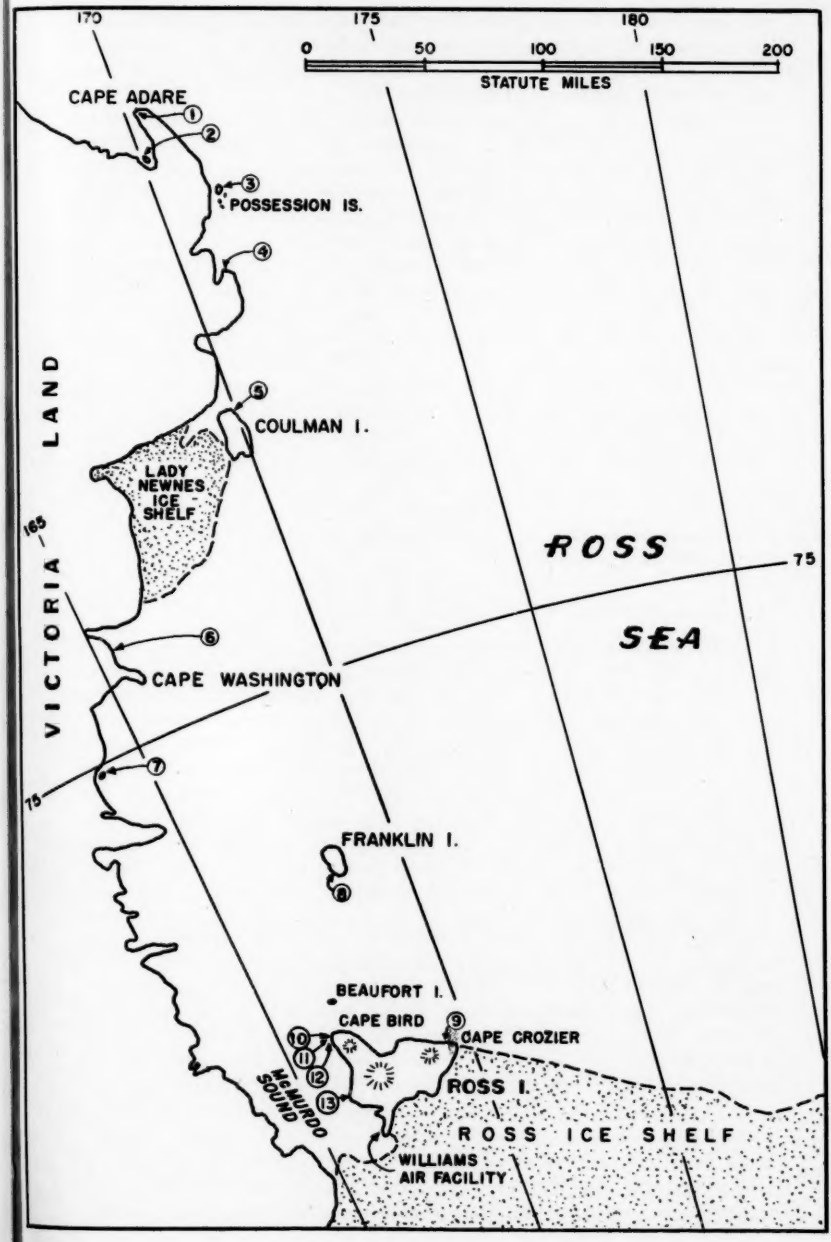
The Adelie's isolation in and beyond the antarctic pack ice has protected it from human interference until very recently, and so far man's depredations have affected it only locally. It is one of the few remaining colonial-nesting birds that probably exists throughout its range just about as it did centuries ago before man started sailing the seas and despoiling the world's wildlife. On all recent U. S. expeditions the Navy authorities have issued strict orders against the killing or interfering with any indigenous wildlife except by biologists in performance of their studies. (And these orders were well enforced on Deep Freeze I.) Unfortunately not all other nations have taken such precautions, and the vastly increased human occupation of Antarctica during the next few years is certain to entail increasing human interference with the Adelies at their nesting sites. It is therefore of greatest importance that as much as possible of the species' present status be put on record for future reference.

The first step is to list the known colonies and to assess their sizes. The accompanying map shows the location of 13 colonies reported in the Ross Sea area. These are described individually below, with the available information on the size of their populations. Quantitative data on these colonies are disappointingly few in the literature. Most reports describe them only in vague, general terms, such as "small," "tremendous," "countless thousands." These are little help in determining possible changes and trends over the years.

It is no trouble to count the birds present in a small Adelie colony, but to obtain a realistic estimate of the population of a large one is neither easy nor simple. To be significant, counts should be made during incubation or during the first fortnight after the young hatch. One of each pair of adults is then always at the nest, and seldom is more than one present, so a count of the adults is fairly representative of the number of pairs in a colony. When the young are 12 to 14 days old, both adults leave the nesting ground and return only at irregular intervals to feed their offspring, which by then have left the nest and gathered in "creches." Populations then can be estimated only by the size of the area the colony occupies. Such estimates are

ADELIE PENGUIN COLONIES IN THE ROSS SEA AREA

1. Ridley Beach
2. Duke of York Id.
3. Svend Foyn Id.
4. Edisto Acres
5. Coulman Id.
6. Wood Bay
7. Inexpressible Id.
8. Franklin Id.
9. Cape Crozier
10. Cape Bird
11. Cape Bird
12. Cape Bird
13. Cape Royds


170
175
180
0 50 100 150 200
STATUTE MILES
CAPE ADARE
1
2
3
POSSESSION IS.
4
5
COULMAN I.
LADY NEWNES ICE SHELF
VICTORIA LAND
165
ROSS
SEA
75
6
CAPE WASHINGTON
7
75
FRANKLIN I.
8
BEAUFORT I.
CAPE BIRD
9
CAPE CROZIER
10
11
12
13
McMURDO SOUND
ROSS I.
ROSS ICE SHELF
WILLIAMS AIR FACILITY

subject to considerable error, for Adelies seldom occupy any territory uniformly, but concentrate their nests a few feet apart in groups of 50 to 500 on the higher spots of ground where they are in less danger of meltwater flooding during a thaw.

I visited only two colonies, numbers 12 and 13, early enough for my counts to be significant. I estimated the population of colony 12 by counting the birds in several well-defined sectors, estimating the ratio of the counted sectors to all the territory occupied, and multiplying accordingly. The Cape Royds colony, no. 13, is small enough so that I could count all the adults fairly accurately from a convenient vantage point. My estimates for colonies 3, 4, and 9 which I visited in February after many if not most of the birds had left, and for numbers 1, 10, and 11 which I examined through binoculars from off shore, are frankly "educated guesses," based on the sizes of their guanoed areas compared to those at sites 12 and 13.

The ideal way to census the population of an Adelie colony is from photographs taken from the air, preferably in late November during the first fortnight of incubation before the females return to relieve the males, though good counts should be possible from pictures taken any time before the chicks are left alone early in January. No such pictures have as yet been taken, and I present the possibility as a worthwhile project for anyone having the opportunity to do so during the forthcoming operations.

1. Ridley Beach, Cape Adare, Victoria Land.

This colony has been visited more often and has had more written about it than any of the other 12 colonies in the area. C. E. Borchgrevink discovered it when he made the first landing on the Antarctic continent there in 1894, and he lived in the midst of it with the first expedition to winter on the continent from 1898 to 1900. His book (1901) describes the colony in general terms and contains some illuminating photographs of portions of it, but makes no estimate of its size.

Scott (1905: 133-137) made his first landing in Antarctica here from *Discovery* in January 1902, and noted it to be "the nesting-place of countless thousands of Adelie penguins." He adds "The hut [Borchgrevink's] is in very good condition, and in such a climate might well remain so for many years to come. Should some future explorers traverse this region, it is well to know that here they possess a retreat in case of emergency, as, although they may not find all the provisions in good condition, a fair proportion is likely to be found so, and at this spot there would always be an abundance of food in the shape of seals or penguins." He left a note in the hut which gave the crew of *Morning* when they landed there the following year the first information that *Discovery* had reached Antarctica.

True to Scott's prophecy, when his northern party under Lt. Campbell was unable to find a suitable base on the east coast of Victoria Land in 1911, they went to Ridley Beach, built a second hut, and wintered over. G. Murray Levick, the party's surgeon, made here the observations for his two classic reports on the Adelie (1914, 1915),

but neither he nor his companion, Priestley, who also describes the colony (1915), published any estimate of its size, other than stating it contained "countless thousands" of birds.

When the USS *Edisto* (AGB-2) visited Ridley Beach 9 and 10 February to investigate its possibilities as an IGY station site, 50-knot winds and a high surf made landing hazardous. On the 9th I accompanied the first landing party that skirted the entire beach just outside the breakers in an LCVP (Landing Craft, Vehicle, Personnel). It was almost impossible to see the top of the beach through the flying spindrift and, badly as I wanted to get ashore to the penguins, Skuas, and Giant Petrels there, I confess to feeling a bit relieved when the skipper decided not to risk a landing, and glad the decision was not mine to make. The next day *Edisto's* whaleboat tried to land, and was overturned by the surf just as it hit the beach. It was finally towed off by the LCVP, while its drenched crew were rescued by helicopter, a ticklish and risky maneuver in the high winds. Throughout this incident the ship was anchored a half mile off the beach, and I had to content myself with viewing the colony (and the two huts which are still standing, apparently in good condition) through the ship's long glass.

The Adelie's breeding season was about over, and only some 2,000 to 2,500 well-grown young and molting adults were still present, being harassed by Skuas and several score Giant Petrels. To judge from the guano deposits and the pictures in Borchgrevink's book, the colony has changed very little, if at all, in the 62 years since he first landed there. The Adelies occupy almost all the triangular foreland, three-quarters of a mile deep, that forms Ridley Beach, and their nests are scattered almost 1,000 feet up the cliff behind it as well, to the top of the first steep slope, just below Hansen's grave. (Nikolai Hansen was Borchgrevink's zoologist. He died of an intestinal ailment 14 October 1899, a half hour after the first Adelie of spring returned, and was buried where he wanted to be, overlooking this fabulous colony.)

The Ridley Beach colony is the second largest in the region. It supports at least 75,000, and perhaps more than 100,000 breeding pairs of Adelies.

2. Duke of York Island, Robertson Bay, Victoria Land.

The small colony at the foot of Robertson Bay some 30 miles south of Ridley Beach, in Crescent Bay on the north side of Duke of York Island, was first visited by the Borchgrevink wintering party in 1899. He makes no mention of it in his text, but shows a photograph of it (1901: 231). In 1912 Priestley (1915: 180) sent two men to examine it, who reported it still there, and to contain about 1,000 pairs of Adelies. *Edisto* did not sail within sight of this colony.

3. Svend Foyne Island, Possession Islands.

When Sir James Clark Ross (1847, Vol. I: 188-189) landed here 12 January 1841 to take possession of the region for his Queen, he "Landed

on a beach of large loose stones and stranded masses of ice. . . . We saw not the smallest appearance of vegetation, but inconceivable myriads of penguins completely and densely covered the whole surface of the island, along the ledges of the precipices, and even to the summits of the hills, attacking us vigorously as we waded through their ranks, and pecking at us with their sharp beaks, disputing possession; which, together with their loud, coarse notes, and the insupportable stench from the deep bed of guano, which had been formed for ages, and which may at some period be valuable to the agriculturalists of our Australian colonies, made us glad to get away again, after loading our boats with geological specimens and penguins."

Borchgrevink landed here in 1894, and again 3 February 1900. On the 1900 visit he found (1901: 257) "Very few penguins were left, but some skuagulls were still soaring about." His photograph of the snow-covered beach shows about 150 adults and full-grown young still present.

Edisto hove to a half mile off Svend Foyne late in the day 10 February. The long glass revealed only a few penguins scattered over the island, but the extensive guano deposits showed the colony still to be pretty much as it must have been when Ross landed there 115 years ago. High winds and a heavy sea thwarted our attempted landing, but I did get ashore 3 days later for a short time just after a 6-inch fall of fluffy snow had covered the ground. The only life present were a single group of 43 forlorn molting adult Adelies on the ice foot, 8 adult Skuas standing idly by, and a single young crabeater seal sound asleep in the snow.

It is apparently a large colony, but does not seem as extensive as the one at Ridley Beach. It is probably on the order of about 50,000 pairs.

4. Edisto Acres, Cape Hallett, Victoria Land.

On 11 February 1956 *Edisto* explored the bay opening up on the north side of Cape Hallett, apparently the first ship to do so. At the mouth of the bay, just inside the Cape, lies a flat, triangular foreland identical to but smaller than Ridley Beach. Here I was able to spend some 6 hours ashore while *Edisto's* crew established a cache of food and fuel and the Seabee engineers surveyed the beach for a possible emergency landing strip at IGY station site.

The guano deposits show the penguins occupy the outer two-thirds of the flat beach, an expanse of roughly 40 acres. An officer who went ashore at both places commented that the deposits here seemed much less continuous and uniform than those on the flat at Ridley Beach. Nor do the nests extend up the cliff here as they do at Ridley. The talus slope at the base of the cliff is occupied by Skuas, of which more than 100 pairs were still present. On the ice in the small lagoon enclosed against the talus by the foreland were a flock of 22 Giant Petrels (see p. 13) and a dozen sleeping Weddell and crabeater seals. On the beach snoozed a mammoth female sea elephant that had strayed far south of its usual range; when we disturbed her she opened her eyes, shed copious tears, and made very rude noises.

The penguins had long since left their nests, but two creches of young still remained on the nesting ground, one of 35 the other of 55 birds, still shedding the last of their nestling down. Just above the ice foot along the beach were eight more groups of Adelies, the smallest of 40 birds, the largest of 150, mostly molting adults, a few well-grown young among them. One knot of 55 bedraggled adults had climbed a hundred feet or so up the steep talus behind the beach to wait out their molt.

From the area the penguins occupy at Edisto Acres, and from the number of Skuas that breed there, the colony probably supports perhaps 25,000, certainly not more than 30,000 pairs of Adelies.

5. Coulman Island.

The only reference I have found to this colony is in Scott's narrative. Forced by an approaching gale 12 January 1902 to shelter *Discovery* under the lee of Coulman Island, Scott (1905: 143-144) comments as follows on the illusive nearness of land seen across antarctic waters: "So strong was this deception that the engines were eased when we were nearly two miles from the cliffs, under the impression that they were only a few hundred yards away; we only discovered our mistake when we saw a colony of penguins, and found that even with glasses it was impossible to distinguish the individuals." As Scott apparently approached the island from the northeast, the colony he saw must be on its eastern flank. I saw no sign of a penguin colony on its northern or western sides when on 11 February in clear weather *Edisto* sailed within 4 miles of the island while trying unsuccessfully to push through the strait between it and Lady Newnes Ice Shelf.

6. Wood Bay, Victoria Land.

When Borchgrevink sailed *Southern Cross* into Wood Bay 6 February 1900, he found on the south side of the bay some 20 miles in from Cape Washington (1901: 260-261) "a promontory almost free of ice and snow. . . . Towards the northwestern side . . . a small penguin colony was thriving, and as the young ones were not so far advanced as those few which were still left at Cape Adare when we departed [2 Feb.], they did not seem to have any immediate intentions of leaving their breeding-place. . . . It was remarkable how the pebbly peninsula on which we landed resembled that at Camp Ridley. On this beach, however, there were no penguins, but a great many skuas with nearly full-grown young ones. It is evident that this low ground from time to time gets swamped by waves started in the small cove to the south."

Scott reports seeing this colony on his way north in *Discovery* 21 February 1904 (1905: 372). To clear the pack in Wood Bay *Discovery* had to stand in "close along the southern shore, where we saw quantities of skuas, and one small Adelie penguin rookery, showing again how these birds take advantage of every landing place."

7. Inexpressible Island, Terra Nova Bay, Victoria Land.

Scott's northern party was put ashore here in February 1912 with 6 weeks of rations and supplies for a short geological exploration, and marooned when heavy ice prevented *Terra Nova* returning for them. The six men under Lt. Campbell spent the winter in a cave they hewed out of glacial ice, and sledded down to Hut Point and safety the following spring. It is one of the pluckiest exploits in the annals of polar exploration, overshadowed only by the tragic epic of Scott's polar party. In his typically understated account of the northern party's adventures, Priestley (1915: 217) reports the presence of a small Adelie colony at the end of Evan's Cove near the southern tip of Inexpressible Island. Most of the birds had left by the time they landed, but when the men realized their plight and started to gather food for the winter, the 120 penguins they were able to kill before the last Adelies left on 15 March were instrumental in carrying them through the winter. The party headed southward 1 October before the Adelies returned, but fortunately a few Emperors appeared to eke out their meager larder.

8. Franklin Island.

Borchgrevink (1901: 268) landed on the southwest side of Franklin Island 9 February 1900 on "a pebbly beach very much like the peninsula at Cape Adare. . . . There were very many penguins on the peninsula, many more than were left at Cape Adare when we said farewell to Camp Ridley." This is verified by his photographs on pages 278-280.

When Ross explored Franklin Island 27 January 1841 a high surf from the south kept his whaleboat away from the beach, and he made a precarious landing on the steep rock cliffs on its northeast side. In such weather as he encountered off the beach he may easily have overlooked its Adelie colony; at any rate he fails to mention it (1847: 215): "We observed that the white petrel had its nests on the ledges of the cliffs, as had also the rapacious skua gull; several seals were seen, and it is by no means improbable that the beach on which we in vain attempted to land may, at the proper season be one of their places of resort, or 'rookeries' as they are termed by the seal fishers."

The ships of Task Force 43 gave Franklin Island a wide berth. The nearest I came to it was when *Glacier* passed 15 miles south of it on her way to McMurdo. The weather was fine, but at that distance the low beach at the southwest corner remained below the horizon.

9. Cape Crozier, Ross Island.

Cape Crozier is so famous as the site of the first known Emperor Penguin breeding ground, found by the *Discovery* expedition on the sea ice below the Cape's junction with the Ross Ice Barrier, that the huge Adelie colony 2 miles west of the Cape on the northeast shores of Ross Island has received little notice, though it is by far the largest in the entire region.

Borchgrevink remarked its presence when he sailed by it in mid-February 1900 (1901: 276). Scott landed there 22 January 1902 and left a message on a post he set up "in the centre of the penguin rookery

on a small cliff overlooking the sea" where the relief expedition in *Morning* found it a year later (1905: 167). A number of sledging parties from both Scott expeditions visited the site, the last being the classic "Worst Journey in the World" (Cherry-Garrard, 1923) made by Wilson, Bowers, and Cherry-Garrard in June and July 1911 to solve the mystery of the winter breeding of the Emperor. Practically every vessel that has sailed to Ross Island since has passed within sight of the colony, which is so immense that nobody has ventured an estimate of its actual size, and very little has been written about it.

Glacier passed 7 miles abeam of the colony on her return to McMurdo 5 January, and one of her helicopters flew over it. Ornithology had too low a priority to secure a berth on this scouting trip, but the pilot reported to me that the Adelies were there "by the jillions." I had my best view of the site 18 February when I was fortunate enough to fly ashore with the team of surveyors, *Edisto's* helicopter landed in the center of the then deserted colony to shoot a "ground control" position observation. There were still about 1,000 Adelies in small groups along the beach and on the nearby snowbanks, most of them molting adults, a few young among them shedding the last of their down before taking to the water.

The colony consists of two sections separated by an ice-covered stretch of cliffs some 1,500 yards wide. The smaller eastern part occupies a low spot along the shore about a half mile long and extends inland almost a quarter mile. The western section spreads along a good mile and a half of the shore line and in places reaches a half mile inland up the slope at the base of Mt. Terror. The guanoed area is roughly about 500 acres in extent, and must support in the neighborhood of 250,000 pairs of birds.

10, 11, 12. Cape Bird, Ross Island.

These three colonies, which everyone who has sailed past Cape Bird into McMurdo Sound has seen, are indicated clearly on the map of the McMurdo Sound Region, No. IV in the Report on Surveys by the British Antarctic Expedition 1910-1913 *(Terra Nova)*. The first colony (number 10) is 4 miles south of Cape Bird, the second and smallest is 2 miles farther south, the third and largest another 3 miles south of the second. *Glacier* came to rest in the thick bay ice about 2½ miles offshore abeam of the southernmost colony (number 12) the morning of 18 December 1955. When I learned we were to remain there at least 12 hours, I lost no time hiking over the ice to it.

Colony 12 lies on a shelf of loose volcanic tuff more than a half mile in length; the nests begin at the brink of its steep scarp about 300 feet above the shore line, and extend another 500 feet up the gentle slope of the terrace behind it. The colony covers about 30 acres, and the most careful count I was able to make was 20,000 birds, with a margin of error of possibly 2,000 either way. As the eggs were just hatching and the adults were still incubating closely, this figure is probably only slightly higher than the number of pairs making up the colony.

Colony 10, to judge by its extent as viewed from several miles off shore, is about two-thirds the size of number 12, on the order of perhaps 12,000 pairs. Colony 11 judged by the same standards is much smaller and probably does not contain many more than 5,000 pairs.

13. Cape Royds, Ross Island.

This small colony is, next to the one at Ridley Beach, one of the best known in the Ross Sea area. Shackleton (1909) built his base just behind it and wintered there in 1908; his hut was occupied for short periods by parties from Scott's last expedition in 1911 and 1912, and by members of his own western party in 1916. Almost every published account of these expeditions contains descriptions and pictures of the colony, but no assessments of its extent or the size of its population have ever been published.

The southernmost colony known, it covers only a few acres. When I first visited it 7 January, many of the chicks were grown to the stage where they were no longer being brooded, and a steady procession of adults was parading back and forth between the colony and the near-by open leads on both sides of the point. From a knoll overlooking the colony I counted 1,850 adult Adelies, and there were fully as many more scattered over the neighboring ice. Around the periphery of the Adelie territory I found 18 Skua nests; 6 more pairs of Skuas had apparently established territories in which I was unable to find nests or young. I think the population of this Adelie colony is about 2,000 pairs.

I visited Cape Royds for the last time 20 February 1956, just before *Edisto* left McMurdo for New Zealand. The bay ice had gone out well beyond Cape Evans to the southward, and as our boat party scrambled ashore on the ice foot below the landing, a flock of 150 ragged molting Adelies squawked at us in annoyance. A quick tour of the point showed five more similar flocks around the rookery, and quite a few smaller groups straggled out along the ice foot on both shores. Of the some 800 birds I counted in the vicinity, less than a dozen were young of the year. These few were rather small, with down still clinging to the head and upper breast. The adults were the crumbiest, most bedraggled, moth-eaten birds I ever saw, and bad tempered as well. They showed almost as much disinclination to move as incubating birds do, and when I went near them many pecked at me and beat my legs with their flippers in furious anger before retreating a few feet. A far higher percentage of adults remained to molt here than at any of the other colonies we visited during the preceding 2 weeks.

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FEMALE EASTERN PURPLE FINCHES

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In the last few years Mr. and Mrs. Parker C. Reed and myself have been able to make, in Lexington and Lincoln, Mass., more or less detailed observations on 41 banded Eastern Purple Finches *(Carpodacus p. purpureus)* which had certainly gone through at least two annual body molts, and possibly more, and which may reasonably be presumed to be females.

We are well aware of Magee's (1926) statement that some males of this species do not become fully red until the second postnuptial molt. On the other hand, we have seen intermediate plumage in a considerable number of birds which eventually proved to be males. These are mostly more strongly pink or ruddy than the birds here treated.

The ascertained number of molts is distributed as follows:

Molts	Birds
2	26
3	9
4	4
5	1
6	1

Some sort of numerical value may be assigned to four items of description: the grade of side streaking, grade of throat marking (Blake, 1955), number of streaks in under tail coverts, and wing length.

The average grade, both of side streaking and of throat marking, for 37 birds is 2.9. The side streaking bears about the same relation to that of first winter plumage as I have already made out. (Blake, 1955, p. 99). On the other hand the grade of the throat markings is a little lower than my previous figure (op. cit., p. 97). The

number of birds known to be definitely aged is too few in the present sample to draw any conclusion about grade of markings and apparent age.

The number of streaks in the under tail coverts averages 0.1 per bird and 92 per cent of 38 birds show no streaks. This is still fewer streaks and a higher proportion unstreaked than is shown by a sample of first winter birds (Blake, pp. 29-40 of this issue). We may conclude from the three characters so far considered that adult females tend to have fewer and thinner ventral markings than do young birds and, in this respect, to approach adult males.

The wing length of 38 birds in the series is slightly more informative. The mean is 80.0 mm. with a standard deviation of 1.5 mm. This is but 0.3 mm. longer than 343 unsexed birds in first winter plumage and only 0.2 mm. longer than 31 males in first winter plumage. We can safely conclude that the three samples do not differ in wing length. The present female sample is the least variable of the three. It is also rather less variable than a sample of adult males. It is reasonable to conclude that females do not increase their wing length either at the first postnuptial molt or at later molts of the primaries. In the cases in which wing lengths were available for different ages of the same bird there was no clear evidence of length increasing with age.

The color of these adult females is more interesting than their metrical characteristics. For 37 of them the color of the margins of the outer vanes of the quill feathers is on record. These margins are at least partly pinkish in 37 per cent of the birds. The percentages climb from 17 percent for the two-molt birds to 100 percent for those with four or five known molts. Hence, about one-third of the birds show the color which one would ordinarily associate with maleness. Considering the large number of molts involved in some of these cases there seems to be no probability that these birds are retarded males. The only bird known after six molts has these margins whitish, perhaps from fading.

I have more than once referred to the fact that a certain number (about 11 or 12 percent) of Purple Finches in first winter plumage show some pink or ruddy in their plumage. The available evidence is that these birds are males. For any who like clean-cut distinctions of age and sex it may be rather disturbing that 47 percent of the

TABLE I. *Percentages of pink or ruddy areas.*

	Female	First winter
Rump	25	29
Crown	23	13
Back	19	12
Face	12	7
Throat	8	12
Shoulders	8	1
Greater secondary coverts	2	8
Lesser coverts	2	5
Middle secondary coverts	2	1
Breast	—	8
Upper tail coverts	—	4

present sample show essentially similar reddish coloration aside from the pink quill edges already noticed. Again, the ruddy color is found on all the birds which have been through at least four molts. The two-molt birds show the color in 39 percent and 29 percent of the three-molt birds show it. There are some differences between these females and first winter birds. The former show 1 1/3 areas per bird while the latter have 2½ areas each. Table I shows the percentage occurrence of reddish in each area for females and for first winter birds.

I am not yet convinced that all the differences between females and first winter birds are meaningful. Considering the relatively small size of the samples and the satisfactory agreement of the most frequent areas, the only differences that appear significant are those of the breast and shoulders. We may, I think, safely conclude that, on the average, females are less extensively reddened than first winter birds, and this will probably prove true even of very old females.

Two points should be made as to the color of transitional (reddened) males in first winter plumage (Blake, pp. 29-40 of this issue) and the very similar male type females here described. First, the reddish colors we are dealing with are more dilute than those of the adult male. The colors I call ruddy are a mixture of the normal brown with some red. They could quite fairly be called brownish red. The pink tints, when present on the normally white parts of feathers, are paler than the corresponding feathers in adult males and when present on parts normally pale brownish appear as brownish pinks. To sum up this point, less red pigment is present in these pink or ruddy areas than would be true of an adult male.

The second point is that the reddish tints are very generally less widespread than in adult males. For example, such tints are rare on the breast and quite wanting on sides, flanks, and under tail coverts. Ruddy coloring of the crown is usually restricted to the posterior half. Certainly few or no birds show visible reddening of all the areas which are red or rosy in adult males.

The most that can be said now is that reddened females on the average have less extensive reddening than have the transitional first winter males. It remains to be determined whether all populations of the species are alike in producing these reddened plumages.

Two further points may also be considered with reference to Magee's (1926) opinion that some males do not become really red until the second postnuptial molt. If the two pinkish males referred to in an earlier paper (Blake 1955, p. 96, 101) as being adult were truly adult and not merely somewhat precocious in completing skull ossification, then they are the only evidence I have personally seen for a delay beyond the first postnuptial molt in assuming full male plumage. On the other hand all the reddened females seen at the appropriate time of year have been evidently female as judged by the condition of vent and belly. I think it safe to say that, in the population or populations visiting Lincoln and Lexington, Mass., any bird that has been through at least one postnuptial molt and is not in full male plumage is certainly a female.

Another aspect of the coloration of adult females is, at least qualitatively, different from that of first winter birds. This is the occurrence of yellowish and occasionally orange in the plumage. It is less common than redness. The percentages in order of increasing number of molts are: 24, 40, 25, 50, and 0. The over-all percentage is 31. The average number of areas per bird is 1 2/3. Only four areas are so far recorded, with percentage frequencies, as follows: throat 47, rump 26, crown 21, and face 10. These percentages are necessarily rather approximate since a total of only 19 areas is involved. Either reddish, yellowish, or both is exhibited by 29 birds and of these only four show both reddish and yellowish.

For the moment we will take both yellow and red carotenoid colors together and note that they occur in about 67 percent of presumed adult females and, further, that the percentage is about 90 in birds with three ascertained molts and 100 in those with more than three molts.

While it is obvious that the difference between yellow and red requires investigation, it is almost certain that the facts will be forthcoming only from experimental work. At least two situations are possible; first, that red and yellow represent two different concentrations of the same pigment or pigments, and second, that the two colors arise from chemically different pigments. Chemical analysis will be required to distinguish these alternatives.

At present I can only conclude that females vary with age in two main directions. A rather high proportion tends to assume male characters. A much smaller fraction develops yellow carotenoid coloring at least as scattered feathers. Finally, a very few birds show an over-all yellowing that seems distinct from any variation known in males (Blake 1955, p. 99, 107).

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NOTES ON JUVENAL PURPLE FINCHES

By CHARLES H. BLAKE

It will have been apparent from my previous papers that the banding station of Mr. and Mrs. Parker C. Reed in Lexington, Mass., is noteworthy for the number of Eastern Purple Finches *(Carpodacus p. purpureus)* banded there. What follows are the first results from a study of 343 birds which could be safely diagnosed as birds of the year during the summer of 1954. The bandings cover the period from 17 July to 24 October. The one juvenal banded on the last date was taken each week through 13 November. It is perhaps quite as remarkable that young birds should have been present for four months as that a few individuals remained for two months or more.

It is obvious that a great debt is owed the Reeds for the time and effort that has gone into the accumulation of this data. I can only hope that my analyses prove worthy of the material.

GAPE COLOR

This large sample has made possible a more detailed study of gape color than I could do earlier. (Compare Blake 1954 b). The chronological results are given in Table I, stated as percentages, except the last column which gives a rank number counting red as 1 and dull yellow as 6.

TABLE I. *Chronological summary of juvenal gape color.*

	No. observations	Red	Red-orange	Orange	Orange-yellow	Yellow	Dull yellow	Aver. gape color
July	35	3		31	11	31	23	4.4
Aug.	316	1	5	13	9	54	18	4.6
Sept.	294		1	5	10	75	9	4.8
Oct.	80		1	4	14	32	49	5.2
Nov.	3						+	6.0
Apr.	3					+		5.0
May	7					+	+	5.1
June	6					+		5.0
July	5		+			+		3.8

The table allows us to conclude only that the gape color becomes progressively more yellow through the late summer and fall. Differences from the generality of brown birds (Blake loc. cit., Table I) do not seem significant but the juvenals are clearly yellower than any known males during July to November. In the following spring and early summer they closely resemble known males.

Other comparisons appear more informative. One of these is with stage of molt (see below). There is a hint from Table II that the gape is reddest at the inception of molt and about the same color as in July and August. This is partly because molt begins in late July or in August in most of these birds. It is quite possible that the color is redder before and yellower after the molt stages here tabulated. Information on the gape color before attainment of independence is an obvious desideratum.

TABLE II. *Gape color related to stage of molt (percentages).*

	No. of observations	Red	Red-orange	Orange	Orange-yellow	Yellow	Dull yellow	Aver. color
2 weeks before molt	14	7		14	7	50	21	4.5
1 week before molt	39		5	13	8	57	15	4.5
Stage 1	91	1	5	10	7	65	23	4.6
Stage 2	65		2	12	9	66	11	4.7
Stage 3	49		4	10	16	59	10	4.6
1 week after stage 3	42			10	12	71	7	4.8

TABLE III. *Comparison of gape color in pink and non-pink birds.*

	No. observations	Red	Red-orange	Orange	Orange-yellow	Yellow	Dull yellow	Aver. color
Non-pink	90		2	11	8	64	14	4.8
Pink	64	3	12	20	19	42	3	3.9

I have already called attention (Blake 1954 a, b, 1955) to the fact that some individuals become ruddy or pinkish at the postjuvenal molt and that such are males as far as known. This plumage type cannot be identified until the bird is quite well along in postjuvenal molt (stage 3 or later). I compare in Table III the data for pink and non-pink birds without regard to date or molt stage. The difference in average color is probably real. We may also tabulate average color for a given stage of molt, as is done in Table IV. It is clear that the pinkish birds are consistently redder than the non-pink ones.

TABLE IV. *Relation between stage of molt and gape color in pink and non-pink birds.*

	Pink birds		Non-pink birds	
Stage of molt	No.	Aver. color	No.	Aver. color
Just before molt	4	3.5	9	4.5
Stage 1	9	3.9	18	4.4
Stage 2	13	4.1	20	4.7
Stage 3	21	3.5	23	5.0
Just after stage 3	17	4.0	20	5.0

For a few birds it was possible to tabulate gape color in relation to the week in which it was reddest. This was done only in cases in which redness increased and then decreased. This tabulation ignores the possibility, suggested by Tables II and IV that the gape color may be reddest before the birds actually come to the traps. If this be so then Table IV relates only to a second reddening. A further indication of an early occurrence of considerable amounts of available carotenoids is given by the presence of pink edges to the quill feathers in some individuals. The information on change of color shown in Table V is unsatisfactory in at least two respects. First, no data are available for the week before maximum redness. I estimate the average at this time to be 3.5. Second, the table ignores the birds which do not show a detectable maximum. The inclusion of such birds would greatly decrease the amplitude in the average column.

TABLE V. *Gape color related to maximum redness.*

Time	No.	Aver. color
3 weeks before	3	4.7
2 weeks before	5	4.0
1 week before	—	—
Week of maximum redness	8	2.4
1 week later	7	4.0
2 weeks later	4	4.5

TABLE VI. *Comparison of under tail covert streaking.*

	Aver. no. of streaks	Percentage of birds showing streaks
Juvenal	5.0	87
First winter	0.7	27

UNDER TAIL COVERTS

Dark streaking of the under tail coverts has been referred to at least twice (Ridgway 1901, Blake 1955), but on different bases. Ridgway mentioned streaking of the longer coverts while my data are based on counts of streaks on all covert feathers. There is no doubt that streaks are more frequent on the short, anterior feathers than elsewhere. Two samples have been drawn from the population. The first is 22 birds in which it seemed reasonable to conclude that the notes gave the number of streaks for the first winter plumage as well as for the juvenal plumage. The two plumages are evidently different as shown in Table VI.

A second sample of 100 birds in juvenal plumage shows 85 percent with streaks and 6.2 streaks per bird on the average.

WING LENGTH

The wing length (chord) of practically all individuals was taken routinely each week. The results are shown in Table VII for the whole series and for three subsamples. For comparison I add a sample of presumed mature females and one of immature, pinkish males. The latter is taken from Blake (1954 a) and is independent of the present juvenal sample.

It is clear that first winter birds do not differ from immature males nor from adult females. This does not mean that individual females do not increase their wing length at the first postnuptial molt or at later molts but any such change can only be shown by correlation for which no data are yet available.

A more important result of these measurements is the opportunity to examine their accuracy. Thirty-two birds yielded series of five or more independent wing measurements. The range within each series varies from zero to three millimeters but is not greater than one millimeter in 26 (= 81 percent) series. The mean range is 1.1 millimeters. Thus the measurements tend to reflect the accuracy with which the scale is read and are not subject, on the whole, to variation due to placement or flattening of the wing.

TABLE VII. *Number, mean, standard deviation, and range of wing lengths (mm.).*

Sample	No.	Mean	Standard deviation	Range
Up to 12 Sept. '54	209	79.7	1.7	76-83
12-19 Sept.	106	80.0	2.1	75-85
21 Sept. and later	28	78.9	2.1	75-83
Total juvenals, '54	343	79.7	1.9	75-85
Adult females	21	80.1	1.5	77-83
Immature males	31	79.8	2.2	76-85

The average of the deviations of individual measurements from their mean, taken separately for each bird, varies from 0.0 to 0.9 mm., and the over-all average of these averages is 0.40 mm. Since this over-all average is less than half the average range, we see that the discrepant measurements are a minority of the measurements in the usual series.

The standard deviation of each series was also calculated. It varies from 0.0 to 1.1 mm. By averaging the corresponding variances we find a mean standard deviation of 0.54 mm. From this mean standard deviation we conclude that 67 percent of the measurements on a single bird will lie within a span of 1.08 mm., or, for practical purposes, within the accuracy of the scale reading, which was to the nearest millimeter.

A final point of interest is that the sample gives no evidence of any growth of the primaries after the birds began to come to the traps nor any evidence of shortening due to wear during their summer and autumn stay.

RUDDY OR PINKISH BIRDS

I have already pointed out that some males are more or less pinkish in first winter plumage. Two different aspects of this redness may be studied in the present series of birds.

First, the margins of the outer vanes of the wing and tail quills may be pinkish instead of olive. Out of the 343 birds, 3.5 percent are so recorded. In nearly half of these birds some quills have olive or buffy edges. One or two outer tail feathers were plucked from a considerable number of birds. Ten such individuals repeated with the replacement quills sufficiently grown to reveal the margin color. One of these birds displayed pinkish. Considering the sample sizes I see no reason to suppose that 10 percent is significantly larger than 3.5 percent. Of the birds with pinkish quill margins only two also showed some pinkish or ruddy tint in the body plumage. It is not really surprising that the number should be so small. In the first place the quills are fully developed before the onset of postjuvenal molt. Carotenoids available at the time of quill growth may not be available later or vice versa. The time difference is probably a minimum of three weeks and often more. A consideration of Table VIII will show that the proportion of pinkish quill margins displayed by ruddy and non-ruddy birds can not be taken as different from the proportion in the whole population. So far as we can go at present, pinkish quill margins and pinkish or ruddy tints elsewhere in the plumage are acquired independently.

Our second point is the presence of ruddy or pinkish tints in parts of the plumage other than wing or tail quills. Such coloring

TABLE VIII. *Percentages of ruddy or pinkish color.*

Character	Whole series	Ruddy	Non-ruddy
Pinkish quill margins	3.5	6.	3.
Same and/or ruddy	12.5		
Ruddy body color	9.6		

TABLE IX. *Number of cases of reddening of the cited areas.*

Rump	24
Crown	11
Back	10
Throat	10
Greater secondary coverts	7
Breast	7
Face and/or ears	6
Lesser wing coverts	4
Upper tail coverts	3
Humerals	1
Middle secondary coverts	1

varies in intensity from a very faint tinting to color approaching that of the adult male. Its area may be very restricted or may extend to practically all the regions which are red or rosy in the fully colored male. The occurrence of such reddened areas is shown in Table IX. The average bird has 2½ ruddy areas. On the whole the reddest areas in the adult male are most frequently ruddy or pinkish in first winter birds. In this series only one bird showed reddening of all the red areas of the adult male.

It is probable that additional birds developed redness after they passed out of the available population. These would be birds that were not seen in stage 3 of the postjuvenal molt or later. In general it is not until about stage 3 that enough first winter feathers are developed in appropriate places to judge whether the bird will show reddening.

Since this red color is largely confined to the margins of the feathers bearing it, it may be abraded away after a few months. We handled in early May 1955 a bird which was recorded the previous fall as showing a trace of ruddy in the rump; this had already been lost. The completion of molt in the same bird had brought to view ruddy areas not visible the previous fall when it was last seen just after stage 3 of molt.

As far as is now known these birds are males. If this be true of all of them, then they still are only about 23 percent of the males in the population of first winter birds.

Another estimate may be made from the fraction of birds handled in or after stage 3 of molt that showed reddening. The figure is 26 percent or about half the probable males in this population. The difference in estimates is reasonable in view of the discussion above.

THE BANDED POPULATION

The period of study extended from the week of 14 July to the week of 9 November, 1954. For the major part of this period usable results on population turnover and other matters may be obtained. All the figures have been placed on a weekly basis and referred to the first day of the week. For methods see Blake (1953). The figures for the population as a whole are shown in Table X.

We must allow for the fact that this table is distorted at both ends but in somewhat different ways. The only ascertained juvenals, banded before 7 August were those recaptured the week of 4 August

or later. In the later part of the table any birds already in first winter plumage at banding would be missing. The effect is to omit from both ends of the table birds whose stay was short.

The population shows two peaks, one early in August and the other nearly six weeks later, the middle of September. Both of these peaks seem mainly to come from a large influx of new birds. It will be seen later that there is evidence for the appearance of a new population on 12 September and later.

A special study was made of those individuals whose stay was three weeks or longer. This length of stay was chosen rather arbitrarily. The mean stay of the 306 birds banded during the weeks of 4 August to 29 September was 1.1 weeks. The main items of information on long stay birds are gathered in Table XI.

This table is also distorted at the beginning for the same reason as noted for Table X. We see that the population, banded and present, shows a single peak a week later than the first peak of the whole population. The mean stay of these long stay birds is 4.2 weeks or nearly four times as long as the stay of the average bird.

RETURNS

Although only a small part of the subsequent history of these birds is available now (August 1955), that small part is not without interest. Returns began on 10 April 1955 with one bird and 14 have so far shown up. All of these birds were banded between 17 July and 14 August. Proportionately this is 4.1 percent of the whole banded population or 12.0 percent of the birds banded through 14 August.

When we look at the individual histories we find that 11 of these returns were long stay birds, that is 23 percent of the birds have supplied 79 percent of the returns. In contrast to the figures given above, 14.1 percent of the long stay birds have returned or 22.5 percent of those banded through 14 August. On the other hand, the short stay birds showed a return rate of 1.1 percent, or considering only those banded through 14 August, a rate of 4.4 percent.

The conclusions that may now be drawn are that, first, long stay birds tended to form some sort of attachment to the banding station which led them to visit it again, even if briefly. Second, the birds banded earlier in the season were probably raised nearer the station than the later birds and returned to its general vicinity to breed.

One bird, 55-02491, reappeared on 1 May 1955 and was not taken again until 7 August. With three exceptions returned birds were trapped only on a single week end each. The birds that repeated stayed 9, 11, and 13 weeks respectively.

Only one bird was recovered away from Lexington. This was the last one banded and was present from 24 October to 13 November and was trapped by Mr. Charles J. Paine in Weston, Mass., on 10 December. Practically all Purple Finches left Lexington by mid-November.

While there is no evidence of loss of wing length during the summer and fall, a just measurable amount of abrasion was found during the spring. Counting by months from the date of banding, little or no

TABLE X. *Population, turnover, and mean stay.*

Week	Banded birds present	New bandings	Arrival ratio, %	Departure ratio, %	Turnover ratio	Turnover time, weeks	Mean stay of new birds, weeks
14 July	9	9	100	0	50	2.0	4.9
21 "	30	21	70	0	35	2.9	3.3
28 "	30	0	0	0	0	—	—
4 Aug.	97	67	69	30	49	2.0	2.0
11 "	91	24	26	42	34	2.9	1.7
18 "	83	28	34	37	35	2.9	1.0
25 "	72	20	27	35	31	3.2	0.8
1 Sept.	83	37	45	49	47	2.1	0.4
8 "	84	51	61	60	60	1.7	1.0
15 "	90	57	63	54	58	1.7	0.8
22 "	52	11	21	46	33	3.0	0.8
29 "	37	11	30	40	35	2.9	1.4
6 Oct.	26	2	8	62	35	2.9	0.0
13 "	10	0	0	50	25	4.0	0.0
20 "	6	1	17	50	33	3.0	4.0
27 "	3	0	0	33	16	6.1	0.0
2 Nov.	2	0	0	50	25	4.0	0.0
9 "	1	0	0	100	50	2.0	0.0

TABLE XI. *Data on long stay birds*

Week of banding	*Length of stay, weeks* 3	4	5	6	7	8	9	10	*Population* Banded & present	Per cent of total population present	Per cent of all long stay birds	*Bandings* Total bandings	Per cent of all weeks bandings	Per cent of all long stay birds	*Departures* Departures	Per cent of all weeks departures	Per cent of all long stay birds
14 July	1	3	3	1		1			9	100	9	9	100	11			
21 "	8	1		1	1			1	21	70	27	12	57	15			
28 "									21	70	27	0	—	0			
4 Aug.	5	9	1	4	1	2			43	44	55	22	33	28	1	3	1
11 "	4	2		1					49	53	63	7	29	9	9	24	9
18 "	4								44	53	57	4	14	5	4	13	5
25 "	1				1				42	58	54	2	10	3	8	32	10
1 Sept.	1								35	42	45	1	3	1	14	34	18
8 "	1	5	2						29	35	37	8	16	10	8	16	10
15 "	5	1	1						28	31	36	7	12	9	5	10	6
22 "	1	1							25	48	32	2	18	3	3	12	4
29 "	1	1	1						25	68	32	3	27	4	4	27	5
6 Oct.									21	81	27	0	0	0	11	69	14
13 "									10	100	13	0	0	0	5	100	6
20 "	1								6	100	8	1	100	1	3	100	4
27 "									3	100	4				1	100	1
2 Nov.									2	100	2				1	100	1
9 "									1	100	1				1	100	1
Totals	33	23	8	7	3	3	0	1									

loss occurs for eight months, about half a millimeter in 9 or 10 months, and about two-thirds of a millimeter in 11 months. We suggest a pattern of abrasion in which no measurable loss occurs until the primaries are about 9 months old. It then proceeds at an increasing rate until the feathers are dropped when they are some 12 to 13 months old.

POSTJUVENAL MOLT

I cannot yet give a complete account of the postjuvenal molt, but the earlier stages, which have already been referred to, are fairly readily defined. These stages are, of course, arbitrary divisions of a continuous process and are separated from each other in time by about a week.

Stage 1—Molt in one or more of the following areas: breast, lesser wing coverts, shoulders; and no other areas. This stage occurs within a week of the inception of molt.

Stage 2—Molt continuing in the regions listed for stage 1 and, in addition, in back or rump, or, frequently, crown and rump; rarely in other areas.

Stage 3—Molt in breast, crown, and rump, frequently in throat, shoulders back, tail coverts, and, less commonly, in other areas.

No clear evidence of the duration of postjuvenal molt was obtained but I suspect it will be found to be between eight and 10 weeks.

One special point should be noted. In 22 birds it was possible to determine the relation between the molt of the middle and greater secondary coverts. In 86 percent of the birds the beginning of molt in the greater coverts preceded that in the middle coverts.

At this point it is proper to advert to the birds banded on 12 and 18 September. It was apparent on handling the newly banded birds on 12 September that they were not as far along in molt as the repeating previously banded birds. For 30 repeating birds and 49 new banded birds an estimate was made of the stage of molt expressed simply as weeks before or after inception of molt. The results appear in Table XII. The average situation is 3½ weeks after for the repeaters and 1½ weeks after for the new birds.

The week of inception of molt was estimated for 138 birds banded before 12 September and for 81 birds banded on 12 and 18 September and expressed in percentages as shown in Table XIII. The average date for the birds banded before 12 September is about 17 August

TABLE XII. *Weeks of molt as of 12 September.*

Weeks	Birds previously banded	Birds banded on 12 Sept.
0		8
1	3	19
2	5	13
3	5	6
4	8	3
5	6	
6	2	
7	1	

TABLE XIII. *Inception of molt.*

Week of	Per cent of whole series	Per cent of birds banded before 12 Sept.	Per cent of birds banded 12, 18 Sept.
14 July	½	1	
21 "	½	1	
28 "	7	11	
4 Aug.	12	19	
11 "	10	17	
18 "	13	24	
25 "	12	15	6
1 Sept.	19	12	32
8 "	15	1	40
15 "	8		21
22 "	½		1

and for the later series about 10 September, a difference of 3½ weeks.

It may be objected that any arbitrary division of the whole series would yield a table resembling Table XIII. It is quite true that a certain resemblance would be expected. If we make a similar comparison of birds banded before 18 August and those banded from 18 August up to but not including 12 September, we find the difference in average inception of molt to be two weeks. The overlap of the two sets of birds is about five weeks instead of the three weeks shown in Table XIII.

What all this appears to mean is that the juvenals are, in general, pretty much of an age when first trapped, so later arrivals begin molt later in time. To this general statement there seem to have been two exceptions: (1) the earliest birds banded arrived from nearby as relatively younger birds than the later arrivals and (2) the September birds discussed above arrived from some area different from the source of most of the population, moved rapidly, and so first appeared also as relatively young birds.

SUMMARY

In discussing the juvenal Purple Finches banded at Lexington, Mass., in the summer and fall of 1954, we have shown gape color to become gradually yellower.

The juvenal plumage has more thickly streaked under tail coverts in a much larger fraction of the birds than does the first winter plumage.

Wing length is the same as in brown birds generally or in adult females. Wear is not appreciable until the primaries are about 9 months old.

Some 3½ percent of the birds show pinkish edges to the quill vanes in the first winter plumage and about 11½ percent show some pink in this plumage. This tinting is independently acquired in the quill feathers and in the contour feathers.

The banded population showed definite peaks. The maximum turnover was in the first half of September. The birds which stayed three weeks or longer showed one, relatively early peak of numbers present. These long stay birds produced the great bulk of the returns.

All returns in the spring and summer of 1955 came from birds banded not later than 14 August.

Three early stages of postjuvenal molt are described. Differences in time of molt in parts of the population are discussed.

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GENERAL NOTES

Observations on a Wintering Flicker.—A male Flicker *(Colaptes auratus)* that I first saw December 30, 1953, at my feeding shelf in Baltimore, and color-banded there 9 days later, was present in a rather wide area about my home through April 10, 1954. His disappearance coincided with an influx of the species on the night of April 10-11; that was the main arrival of the year in the neighborhood, where the Flicker is normally a summer resident; the very first new bird had been present March 7-18 and I had seen 2 or 3 passing singles after that. On July 15-16 the color-banded male was back on his wintering ground, feeding two partly independent juveniles. Again October 12-14 he reappeared; on October 14 a female was with him during the few minutes he was seen. He did not return in 1955.

Winter range. During his winter stay I found this bird chiefly—that is, frequently—within an area half a mile long and a fifth of a mile wide; occasionally the width of his range was extended to a third of a mile. There were times when I could not find him and he may have been outside those boundaries. There was a large wood at one end of the area and a very small one near the other end; a good part of the intervening and surrounding residential territory was fairly well wooded.

Although my complete record of the bird suggests that he nested somewhere in my region, I am confident that he did not do so within the range just described, for I searched there—and also well beyond, on all sides—many times during the summer, and scanned for bands the great majority of all Flickers encountered, without finding him. Also, the part of the range in which he made his July and October reappearances was occupied during the summer by an unbanded male.

First singing, drumming. As far as I could observe, the wintering male came into song on February 22, and began to drum on February 25; the migrant male that was present March 7-18 sang on some days from March 10 on. My records for 15 previous years show no Flicker song before March 10 except once on February 27 by an isolated passing bird, and once on March 5 by an early arrival. My previous earliest date for drumming was March 18.

Hole-digging. On February 25 I found the Flicker digging a hole 43 feet up in the dead top of a tree; the hole at that time ran in horizontally about 1½ inches. On several more days through April 1 I saw him work there; by that time he had begun to dig downward. That was the last digging I saw him do.

Both during that period and later, this hole was a tremendous attraction to other woodpeckers—permanent residents, migrants and summer residents alike. On February 25 a color-banded resident female Downy Woodpecker *(Dendrocopos pubescens)* went within a few feet of it while the Flicker was digging, and her unbanded mate examined it during an absence of the Flicker.

Also on February 25, a migrating or wandering male Red-bellied Woodpecker *(Centurus carolinus)* actually drove the Flicker away from the hole in order to dig in his stead. Again on March 2 some digging was done by, and on March 7 the hole was at least visited by, a Red-belly that presumably was the same bird.

On March 18 the hole was worked upon by the migrant male Flicker that was present March 7-18. On April 11 it was worked on by still another male Flicker which that day took up this part of the banded one's now deserted winter range, and on May 1 both a male and a female Flicker, and on May 2 the female again, did some digging. On these May days, though, the Flickers were much bothered by Starlings *(Sturnus vulgaris)* and they abandoned the place.

Finally, on May 5, a pair of Red-headed Woodpeckers *(Melanerpes erythrocephalus)* attempted to work at the hole; these, too, were continually attacked by the Starlings, and gave up on the same day.

The Starlings had begun frequenting the tree on April 7, and the hole itself by April 10. By April 20 they had taken in some nest material, and they added to this occasionally through May 5. However, in this instance they were defeated by their own pugnacity: their attacks had prevented the woodpeckers from digging the hole to a usable depth, and after a while they abandoned it themselves.

Feeding. Through March 31 the banded Flicker came frequently to my feeder for suet, and often ate lengthily, yet this by no means weaned him from natural foods. On one day, for example, after spending 10 minutes at the suet he went directly to a wood and began foraging and was still so engaged 40 minutes later when I had to stop watching. Because such statements as I can find about the winter feeding of Flickers emphasize their hunting over the ground or their dependence on fruits and seeds, it seems worth mentioning that besides doing some searching of the ground—where in another winter I once found a male Flicker pounding acorns to pieces—my bird spent considerable time in trees seeking insects. I several times saw him peck lengthily at particular spots on branches as if digging for prey, and once clearly saw him excavate at the base of a dead branch just as a Downy Woodpecker might have done. At other times he picked here and there at branches he was moving over, also in the manner of a Downy, chipped bits of bark off both live and dead stems, peered under the projecting edges of large white oak *(Quercus alba)* bark scales, and searched through piles of dead leaves that had collected in forks. Such heaps of trash probably hold hibernating insects, for I once saw the Flicker swallow after probing in one, and I have on other occasions seen a Flicker and Downy Woodpeckers search them. The leaf nests of gray squirrels *(Sciurus carolinensis)* are searched similarly by Starlings.—Hervey Brackbill, 2620 Poplar Drive, Baltimore 7, Maryland.

Roseate Tern Nesting in Nova Scotia.—During June and early July of 1956, while banding terns in the Tusket Islands, Yarmouth County, Nova Scotia, we visited six islands which supported mixed colonies of Common and Arctic Terns. On only one island, shown on the British Admiralty chart as Little Bald, but known locally as Mossy Bald, we also found a very small group of Roseate Terns and were able to band one Roseate chick.

In an article which appeared in the January-February, 1956 issue of *Audubon Magazine*, Dr. Harrison Lewis reported that Roseates were seen occasionally along the south shore of Nova Scotia, but that there was no current record of a breeding colony. We are glad to be able to report that Roseates are still among the breeding birds of Nova Scotia.—David and Marie Henry, 64 Hoitt Road, Belmont 78, Massachusetts.

RECENT LITERATURE

BANDING

(See also Number 54)

1. The Greenland Bird-Ringing Scheme. Anon. 1956. *Polar Record* **8**(54): 270-271. (Summarized from information provided by Dr. Finn Salomonsen, Universitetets Zoologiske Museum, Kφbenhavn.) "Administrative officials throughout Greenland organize bird-ringing as part of their official duties. Supplies of

rings and notebooks are sent to about eighty centres each year, and are given to suitable men chosen by the local officials. A reward is paid for each bird ringed. This varies according to the difficulties from Kr. 10 for ringing a Sea Eagle to 12 øre for a Snow Bunting. . . . A reward of Kr. 2 is also offered for the recovery of a ringed bird. In order to claim the reward the foot of the bird bearing the ring must be presented to the local magistrate. This enables the species to be identified. No reward is paid if the bird is recaptured in the breeding place in which it was ringed. The expenses of the project are borne by the Ministeriet for Grønland and amount annually to about Kr. 10,000."

From 1946 to 1954 inclusive, 30,215 birds of 21 species were banded, and 2,474 recovered, a phenomenal 8.2 percent. Highest percentages were for *Haliaetus albicilla* 38 percent, *Phalacrocorax carbo* 30 percent, *Corvus corax* 27 percent, *Anser albifrons* 23 percent, *Larus glaucoides* 22 percent, and *Calidris maritima* 20 percent.—O. L. Austin, Jr.

2. Results of the ringing investigation of migration instituted by the Royal Museum of Natural History, Leiden, 51 (1954), 1. (Resultaten van het ringonderzoek betreffende de vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie te Leiden, XLI (1954), 1.) G. C. A. Junge and J. Taapken. 1956. *Limosa* **29**(1-3): 66-95. A long list of recoveries received in 1954 for birds banded in the Netherlands. This section covers the herons through the waders and contains a large number of records, most of them of waterfowl taken during the period 1947-1953, at long last being reported from the U.S.S.R.—O. L. Austin, Jr.

3. Report of the Ringing Committee for the Year Ending March 1956. P. C. Bull. 1956. *Notornis*, **7**(1): 8-13. The 2,717 birds of 19 species banded by "a little under 20" cooperators in New Zealand this year is lower than the previous year's total, but brings the grand total up to 21,360, from which 1,273 recoveries have been received to date. Most rewardng have been the results from banding Gannets *(Morus serrator)*, which breed in New Zealand and winter westward to Australia. One bird traveled some 1,700 miles across the Tasman Sea within 8 days; the long-distance record is a young bird recovered on the west coast of Australia almost 4,000 miles awav 8 months after banding. An unusual recovery was the band from a young Black-backed Gull *(Larus dominicanus)* found 17 months after banding inside a fish caught near by. This year for the first time some 350 petrels and shearwaters were banded at sea from fishing boats in Cook Strait; it would be interesting to know how they catch these birds for banding. The New Zealand program is finding its bands do not last on the birds as long as they should. Those on Gannets returning to one rookery "had to be replaced after only three to five years on the birds."—O. L. Austin, Jr.

4. Report of the Swiss Bird Observatory Sempach for the years 1953 and 1954. (Bericht der Schweizerischen Vogelwarte Sempach für die Jahre 1953 and 1954.) Alfred Schifferli. 1955. *Der Ornithologische Beobachter* **52**(6): 169-183. This paper reports on the financial, organizational, and scientific status of Sempach during the period under review. Noteworthy was the opening of the new research station buildings of which a rather complete description with photographs is included. Research projects mentioned include preparation of a nesting bird book, population studies, waterfowl census; studies on the Heron, White Stork, and Lapwing; the effects of birds on the larch leaf-roller; and on bird protection and the furtherance of ornithological education. A brief review of banding activities reports 28,553 birds banded during this period, a decline from 33,621 banded during the preceding 2 years. Recoveries numbered 382 or 1.3 percent. Approximately one-half of the birds were banded as nestlings. —R. O. Bender.

5. Swiss Banding Recoveries. (Schweizeriche Ringfundmeldung.) Alfred Schifferli. 1955. *Der Ornithologische Beobachter*, **52**(6): 184-202. This paper reports on recoveries of Swiss banded birds during 1953 and 1954, excluding near recoveries. It also includes data on birds banded outside of Switzerland and recovered within it. Notable among the reports is the large number of

Starlings *(Sturnis vulgaris)* recovered in Africa, including one banded in Gossan 19 May 1953 and recovered at 32° 18′N 9° 10′W in Morocco 15 November 1953, a distance of 2,200 km. A Brambling *(Fringilla montifringilla)* banded 4 February 1939 at Madretsch was recovered in January 1940 at 42° 40′N 42° 50′E in Russia, 2,900 km ESE. A Pintail *(Anas acuta)* banded 7 August 1941 at 46° 24′N 43° 22′E in Russia was recovered on 24 February 1942 at Ermatingen after a journey of 2,900 km W. These are only a few of the many records in the report which will be of great value to students of migration routes in Europe. —R. O. Bender.

6. Determining Age of Birds at Banding Time. (Die Altersbezeichnung von Ringvögeln.) 1955. Gerhard Zink. *Die Vogelwarte*, **18**(1): 1-5. German bird banders are required to distinguish between unfledged and fledged birds. A further separation is not always possible, but highly desirable. The designation "young (juv.)" is to be avoided and should be replaced by "bird of the year" or "bird of the preceding year." The term "old" may be supplemented by comments such as: not bird of the preceding year, at least second breeding plumage, etc. When possible separate breeding birds, i.e. "local" from migrants. Zink warns banders to be accurate and urges them to report on physiological condition, age, development, etc., in as much detail as possible to enhance the value of their banding records.—Frances Hamerstrom.

MIGRATION
(See also Numbers 54, 55)

7. Meteorological Variables and the Northward Movement of Nocturnal Land Bird Migrants. Gilbert S. Raynor. 1956. *Auk*, **73**(2): 153-175, In this very interesting paper the author, a meteorologist, advances the hypothesis that "nocturnal migrants find flight easier through stable air than through turbulent air, that stable conditions are of major importance in triggering such flights, and that a positive relationship exists between atmospheric stability and nocturnal migrations."

Raynor examined 2,500 reports of migrants and plotted their probable flight paths on maps showing areas of stable and unstable air, wind direction and speed at 2,000 feet, and surface weather conditions classified as favorable, unfavorable, or intermediate. From the analysis of these maps he concludes that spring migration normally takes place with favorable winds in stable air and that migratory flights are often terminated at the edge of an area of unstable air or unfavorable winds.

Raynor's arguments are logical and very convincing, but few readers will accept the statistics with which he tries to prove his case. He submits his classification of the probable paths of the migrants' flights to statistical analysis and concludes that the results are "highly significant" in favor of his hypothesis. Yet he admits that the classification which he is analyzing statistically "is dependent for accuracy on my judgment of how great a distance was travelled by each flight." Such procedures weaken an otherwise valid interpretation of observed phenomena.—William H. Allen.

8. Compass Directional Training of Western Meadowlarks *(Sturnelia neglecta)*. Ursula von Saint-Paul. 1956. *Auk*, **73**(2): 203-210. This paper reports on an experiment in which five hand-reared Western Meadowlarks were trained to seek food in a given direction. Training was given at the same time each day. The training method used eliminated all visible directional clues other than the sun. After 20 days of training each bird was tested when the sun's position differed from that in the training period, to determine whether the bird would choose a direction based on a constant angle with the sun or select correctly the true direction used in training. (The use of the term "compass direction" in this paper is confusing; it is apparently intended as a synonym for "true direction.") When the sun was visible two birds were able to select the true direction within 90 degrees, one tended to maintain a constant angle with the sun, and tests on two were inconclusive. "On overcast days the birds were disoriented." The author seems justified in stating "The results of this

study give further support to the supposition that the ability of true azimuth orientation, where the sun's azimuth position and time of day are the necessary requirements, is general among birds." However, her statement that "the sun is treated [by birds] in a peculiar manner which is the product of an elaborate evolutionary process" needs further clarification and substantiation.—William H. Allen.

9. New Data on the Mediterranean Gull. (Nouvelles données sur *Larus melanocephalus* Temminck.) Nöel Mayaud. *Alauda,* **24**(2): 123-131. From 34,443 Mediterranean Gulls banded at Orlov in Russia between 1930-1952 there have been 627 (1.7%) recoveries. A study of these shows the main migratory movements of the species. The gulls travel and winter in homogeneous groups. Most of them migrate west and southwest, a small contingent southwards and another minor group to the Caucasian coasts of the Black Sea. Their chief wintering areas are the Mediterranean coasts of southern Italy, Tunisia, Greece, France, and Spain. During their westward journey the gulls traverse great land masses, plains, and mountains. The most easterly point reached is the Azov Sea, the most northerly and westerly the Baltic and North Seas as well as the French and Portuguese Atlantic seaboards. Only vagrant and straying individuals, apparently, attain the last three seashores.—Louise de K. Lawrence.

10. Concerning White Stork Migration from Syria through Egypt. (Vom Zug des Weissstorchs in Raum Syrien bis Ägypten.) 1955. Ernst Schüz. *Die Vogelwarte,* **18**(1): 5-13. A comprehensive summary of flock counts, movements, and band records of White Storks *(Ciconia ciconia)* in the Near East. Fall migration is over a rather narrow migration route and of short duration. Spring migration, on the other hand, has been reported over a broad front and of long duration. Schüz believes that as far as breeding adults are concerned, spring migrants travel with as much dispatch as in fall, but that this is masked by observations on hordes of immature storks and a few sick hangers-on. Particularly late migrants may have a weak migratory urge and be uncertain of the route.—Frances Hamerstrom.

11. Delayed Emigration of Certain Birds in Autumn 1954. J. A. G. Barnes. 1956. *British Birds,* **49**(2): 74-79; (4): 167-171. Details are given on late occurrence of summer visitors and passage migrants. Two factors seemed to have contributed to this situation: "a hold-up of departures owing to the lack of favourable weather for migration, and a high rate of survival of lingering birds because of the absence of early frosts and consequent abundance, for the time of year, of insect food."—M. M. Nice.

12. The Migrant Loons of Western Pennsylvania. F. W. Preston. 1956. *Auk,* **73**(2): 235-251. Following an interesting (if involved) mathematical analysis of field observations of the Common Loon on Oneida Lake, Preston concludes there is no evidence that loons in central Western Pennsylvania travel in mated pairs on spring migration.—J. C. Dickinson, Jr.

POPULATION DYNAMICS
(See also Numbers 15, 19, 21, 36)

13. Mortality and Egg Production of the Meadow Pipit with Special Reference to Altitude. J. C. Coulson. 1956. *Bird Study,* **3**(2): 119-132. Analysis of the extensive data from B. T. O. nest record cards of *Anthus pratensis* shows this species starts to lay 3.8 days later in the north of Great Britain than in the south at sea level, and 1 day later for each 130 feet rise in altitude. The mean clutch size of 4.3 eggs decreases from 4.52 near sea level to 4.07 over 1,000 feet, apparently reflecting the more severe climatic conditions at higher altitudes. Breeding success averages 43 percent, and is significantly higher as altitude increases, believed to be due to a decrease in nest predation, particularly by cuckoos, at higher altitudes. Analysis of banding recoveries shows the species' first year mortality after fledging to be 76 percent, and average adult mortality 57 percent. The latter figure is corroborated by the 58 percent average adult mortality obtained from a larger sample of "recaptures" (returns in our usage).

These are intriguing analyses and, as far as I can see from the material presented, the mathematics are correct and the conclusions sound and logical. However, the author fails to point out or to explain one manifest discrepancy, the fact that the rate of recruitment does not balance the annual adult mortality, which it must if a species is to maintain itself. With an annual adult mortality of 57 percent, of each 100 pairs (200 birds) that start a breeding season 114 die before the start of the next one. To maintain the population, therefore, each 100 pairs must fledge enough young so that 114 will survive to start the next breeding season. As this species rears two broods which average 4.3 eggs per clutch with 43 percent success, each 100 pairs fledges 370 young annually, of which 76 percent or 281 die during the ensuing year. This leaves only 89 young, or slightly less than 80 percent of the 114 needed to maintain the population. Therefore Great Britain's Meadow Pipit population must be declining at the rate of about 20 percent per year, Q. E. D.

Let us assume, in the absence of any other evidence to the contrary, that the Meadow Pipit is holding its own in Great Britain—as indeed we trust it is. Then, unless the demonstrated annual loss is being made up by immigrants from abroad (heaven help us, no!), something must be wrong with the figures. I respectfully suggest that the discrepancy most probably lies in the observed fledging success of 43 percent. If all the other figures are valid, and we have no reason to question them, fledging success must be slightly better than 55 percent to produce the required annual recruitment. I submit, then, that it may well be 55 percent in all *unobserved* nests, and the discrepancy of 12 percent is a measure of the nest mortality induced by the visits of the observers to the nests they watched, unwittingly and unintentionally of course, by thereby exposing the nests to easier discovery by crows, gulls, cuckoos, and other natural predators. The only way to prove or disprove the validity of my contention, I fear, is by observing the unobserved nests, which could be done only by enlisting the aid of the pixies and the leprechauns.—O. L. Austin, Jr.

14. The Annual Mortality of the Blue Tit in different Parts of its Range. D. E. Snow. 1956. *British birds*, **49**(5): 174-177. Blue Tits *(Parus caeruleus)* can be distinguished in their first breeding season from older birds by their wing-coverts. The author examined over 1,000 museum specimens from all parts of the range and decided that "the mortality of juveniles is higher than that of adults in October and November, but from December onwards juvenile and adult mortality are about equal." From 320 specimens in the breeding season the author calculated percentages of "adults" and first year birds from Britain, but only 40 to 59 from the other regions. No mention is made as to any difference in number of broods attempted in the different regions. An inverse correlation was found between the percentage of old birds and clutch size: Britain—30% adults, 11.6 eggs; Northern Europe—35%, 9.9 eggs; North Africa—42%, 7.5 eggs; Iberian peninsula—55%, 6 eggs; Canary Islands—55%, 4.3 eggs. "Thus Blue Tits can either breed slowly and live longer, or breed faster and die sooner. It is suggested that the control lies, ultimately, not in the mortality factors themselves, but in the number of young which they can produce annually in the area in which they live." One wishes that this suggestion had been discussed more fully.—M. M. Nice.

NIDIFICATION AND REPRODUCTION
(See also Numbers 13, 14, 31, 36, 45)

15. Observations of a Nesting Colony of American Brant. Thomas W. Barry. 1956. *Auk*, **73**(2): 193-202. The author presents a record of his observations of the Southhampton Island (Hudson Bay) colony of *Branta bernicla hrota*. In 1953, 700 nesting pairs and 400 yearlings visited the island. Previous records are of 2 nests (1934) and eleven nests (1936). It is not known whether the present size of the colony is due to growth or the removal of another colony to this island. The brant colony is located on the mass of small, low islands lying in the 2-mile-wide delta of the Boas River. It is separate from areas occupied by Blue and Snow geese which nest inland on the island. The brant arrived on June 8 and appeared to be mated on arrival. One possible courtship display was noted. Apparently no birds arrived after June 13. The first egg

was found on June 16. Incubation required 23-25 days. Seventeen nests had a total of 75 eggs (av. 4.41). From these 75 eggs, 52 young left the nests. The remainder failed because of various natural causes (sterility, predation, desertion, etc.). Principal predators appear to be Herring Gulls. The arctic fox vacates the wet lowlands when the thaw begins. Polar bears were observed in the colony but they seemed to cause no disturbance and did not molest the birds or nests. Local eskimos prefer to eat the Blue and Snow geese and as a result largely ignore the brant colony. I disagree slightly with Barry's statements along these lines: " . . . the brant congregated . . . to await favorable conditions." "Because they had grown accustomed to me . . . " " . . . they took a strong liking to the *Equisetum* there . . . "—J. C. Dickinson, Jr.

16. A note on the Determinative of the Number of Eggs in a Clutch in the Laro-Limicolae. (Note sur le déterminisme du nombre des oeufs chez les Laro-Limicolae.) C. Ferry. 1956. *Alauda*, **24**(1): 49-52. Basing his argument on K. Paludan's theory that the degeneration of the "emergency" follicles in the ovaries of some species is governed by the tactile stimulus on the brood-patch of the first eggs laid in a clutch, the author cites and discusses three cases in which apparent proof of this theory exists. A black-tailed Godwit *(Limosa limosa)* was found incubating three eggs with a fourth fresh egg, judged by its form and pattern evidently laid by the same female, lying cold 16 cm. from the nest. A Common Tern *(Sterna hirundo)* was similarly incubating three eggs while a fourth, exactly like the three first ones, lay in the grass 30 cm. away. A Ringed Plover *(Charadrius hiaticula)* incubated a second clutch of three eggs while a fourth lay where the female nested the year before and a fifth was found a metre farther on balancing precariously on a piece of rock. The two outside eggs were fresh and cold, and resembled in detail the three in the nest. Moreover, they were strikingly alike to the clutch laid by the same female the previous year in the same spot. In neither case was there any indication of more than one female being involved.—Louise de K. Lawrence.

17. Studies of the Life History of the Pink-billed Weaver in the Lower Senegal Valley. II. The Reproduction. (Recherches Écologiques sur les *Quelea quelea quelea* (L.) de la basse vallée du Sénégal. II. La reproduction.) G. Morel and F. Boulière. 1956. *Alauda*, **24**(2): 97-122. This paper presents the results of studies in 1955 of two nesting colonies and the reproductive behavior of birds kept in an aviary. In 1955 the rains began a month earlier than usual and were heavier than normal. The weavers adapted their reproductive rhythm to the abnormal conditions remarkably. The increased abundance of insects and vegetable foods was believed to be the chief cause of a second nesting cycle which started about 6 weeks after the first one ended.

Six stages of nest construction were recognized: (1) the bridge, (2) the ring, (3) the nest with double openings, (4) the pocket, (5) the covered nest lacking the pent-house only, and (6) the finished nest. The male built the nest, weaving with the bill, the feet playing a lesser role in this work. A whole colony of nests was built in about a week. The larger colony attracted the birds of smaller neighbouring colonies which abandoned their own homes to join the larger community. One tree selected at random contained 65 nests.

The nests were constructed before pair-formation. In the defence of the nest intimidation displays consisted of (1) gaping, (2) "ballooning," wings lifted over the back, tail either elevated or depressed. It was directed against both males and females that visited the nest site. Real fighting, occasionally to the death, often followed these displays. In nuptial displays the birds adopted a horizontal posture, wings lightly opened and vibrating, feathers sleeked, tail sometimes spread. The males displayed before their nests to attract the female, who sometimes but not always responded with similar poses and movements. In some cases the female took the initiative. Pair-formation began at the end of nest construction, intensified rapidly and finally ended in a "frenzy of copulation." At one colony the time elapsed between the first nuptial display and the start of egg-laying was 2 days. Egg-laying often started before the nest was completed and quite often the urgency to lay caused females to drop their eggs on the ground.

The clutch consisted of from one to six eggs. The mean clutch size during the rainy year 1955 was significantly larger than in drier years. While the higher fertility may in part also have been due to the improved food situation resulting from an actual decline in the weaver population that year, the abundance of food produced by the favorable climatic conditions must be considered the major factor.

Territorial behavior in *Quelea quelea* was reduced to defence of the nest itself by the male during construction and by both sexes after pair-formation. Aggressiveness continued intense during incubation but weakened after the young hatched.

The incubation period was 12 days. Both sexes brooded in the daytime and the female was on the nest at night. Nestlife lasted 16 days. The nesting success was greater in nests containing one or two eggs than in those with three or four. It was greater in the favorable nesting season of 1955 than in the previous years. The mean weight of the young was also higher in that year. Experiments with increased daylight advanced sexual maturity in the birds and their molting cycle.

This is an important and careful study based on extensive observation of the birds in the field as well as in captivity, combined with apt experiments. The only criticism this reviewer might make is that a fuller picture on the attentivity during incubation and nest-life would have been desirable. Some life-history students would undoubtedly like to know more about the extremely brief periods of actual sitting and the sharing of duties between the parents in a manner that seems peculiar to the species. Good photographs and drawings illustrate the article.—Louise de K. Lawrence.

18. The Number of Eggs Laid by the Cuckoo. (Eizahl des Kuckucks.) 1955. Gerd Diesselhorst. *Die Vogelwelt*, **76**(2): 53-58. Diesselhorst suggests that accounts of high numbers of eggs laid by cuckoos *(Cuculus canorus)* stem largely from egg collectors who may have stimulated this apparently indeterminate layer to further laying. His 17-year nesting study at Fürstenfeldbruck (912 nests of host species in all, and one to three female cuckoos annually) leads him to believe that the local cuckoos laid at most six eggs apiece. He adds that the hypothesis that the cuckoo is stimulated to further laying by the sight of suitable nests needs testing.—Frances Hamerstrom.

19. Data on the Breeding Biology of the Swift (Apus apus) in Oltingen and Oxford. (Daten zur Fortpflanzungsbiologie des Mauerseglers (Apus apus) in Oltingen and Oxford.) Emil Weitnauer and David Lack. 1955. *Der Ornithologische Beobachter*, **52**(5): 137-141. From the English summary.

1. Comparisons have been made over the same years of Swifts breeding at Oltingen in Switzerland and Oxford in England, Oxford being about 800 km northwest of Oltingen and having a cooler and wetter summer.
2. On the average, laying starts 5 days earlier at Oltingen than Oxford, but the interval has varied in different years owing to the weather.
3. The average clutch is highest in the 3rd week of May, declines markedly in the last week of May and still more in June. Among clutches laid between the same dates, those at Oltingen have been little if any larger than those at Oxford.
4. All the young from broods of 3 have been raised successfully at Oltingen except in the occasional bad summer, but at Oxford only in the occasional fine summer. Each 100 pairs raises on the average 50 more young each year at Oltingen than Oxford.—R. O. Bender.

20. Observations on the Tawny Owl. (Beobachtungen am Waldkauz (Strix aluco).) Samuel Siegenthaler. 1953. *Der Ornithologische Beobachter*, **53**(1): 10-12. The author used small kegs hung at a height of 6-9 m for nesting houses. Each evening at dusk, the female left the nest for 20-25 minutes; during this time the nest was examined so that the female was not disturbed. The first egg was laid on 7 March, the second on the 10th and the third on the 14th. Each egg hatched 29 days after laying. All the young left the nest together on 10 May when the oldest was 35 and the youngest 28 days old. At first they hunted insects on the ground, later they hunted mice. The young

were still being fed by the female at the end of August. The author found no evidence of a second brood. During periods of bad weather, especially in poor mouse years, this species and the Barn Owl *(Tyto alba)* will eat their young, selecting first the smallest. During these periods they also take many other birds.—R. O. Bender.

21. Contributions on the Biology of the Raven *(Corvus corax).* Beiträge zur Biologie des Kolkraben. Rolf Hauri. 1956. *Der Ornithologische Beobachter,* **53**(2): 28-35. The author reviews the distribution of the Raven in Bern Canton and reports that it is becoming more common as a nesting bird. He then reports on several incidents in which an adult bird apparently carried water in its throat to give to the young. Water was secured about 10 m below the nest. In other cases, food was immersed in water before being presented to the young. The frequency of this behavior diminished as the young grew older and ceased when they were approximately 30 days old. In warm weather, water was carried more often. In this area, the Ravens did not use the same nesting site more than once. (The nests were situated in cliffs.) Of 15 young observed, at least five died during or shortly after the nesting period, one after 7 and another after 16 months. In winter, the old Ravens with their young frequented an area at least 16x16 km in area.—R. O. Bender.

22. Observations at a Golden Eagle's Nest. (Beobachtungen an einem Steinadlerhorst.) Heinz Iselin. 1956. *Der Ornithologische Beobachter,* **53**(2): 125-128. A Golden Eagle *(Aquila chrysaëtos)* nest near Davos, Switzerland, was located in a rocky cliff 20 m in height at an altitude of 1890 m in an area rich in game. The smaller of the two young was found dead at the foot of the cliff a few days after the nest was discovered. The remaining young was successfully raised. Periodically the old birds brought fresh tree branches to the nest. Principal food appeared to be the marmot. Most of the paper is concerned with observed details of exercise, feeding, and resting of the young bird.—R. O. Bender.

23. Some Notes on the Red-spotted Bluethroat. S. B. Peakall. 1956. *British Birds,* **49**(4): 135-139. Observations on 7 nests of *Cyanosylvia s. svecica* at Abisko in Swedish Lapland. Building and incubation were performed by the hen only. In nests with eggs, females were present on 49 of 50 visits. Incubation in two nests lasted 12 and 13 days; fledging 10 to 12 days. Cock and hen fed about equally. A nest was watched "periodically" for 24 hours when the young were 4 to 5 days old. The female brooded from 22.15 to 03.00. "The working day of the cock was somewhat longer, feeding continuing until 23.15 hours and commencing again at 03.00 hours, a working day of 20¾ hours."—M. M. Nice.

24. A Survey of the Habit of Nest-Appropriation. N. L. Roberts. 1955. *Emu,* **55**(2): 110-126; (3): 173-184. The author presents a broad, general account of the well-known habit of certain birds to use the nests of other species instead of building their own, a phenomenon as yet imperfectly understood despite a voluminous literature. Australian sources, both published and unpublished, yield references to its occurrence in 80 species of Australian birds. Consultation of standard sources and correspondence with other observers throughout the world show the habit to occur practically wherever birds have been studied. Most widely demonstrated, perhaps, by certain birds of prey, it is indulged in more or less frequently by a wide range of other groups as well. It varies in degree from the few species that always appropriate other birds' nests and never build one of their own, to infrequent, isolated cases of it in many species that normally build their own nests. "A study of these records does not reveal any single or simple explanation of the habit of nest-appropriation . . . the habit . . . cannot be explained on any phylogenetic basis, for it has arisen independently in a number of widely-different groups, which build very diverse structures." Nor is the author convinced that the modern behaviorists' generally accepted explanation of "imprinting" answers the problem adequately. "How for example, can it account for the long list of single records?" A thought-provoking discussion of a subject that promises ample reward for further intelligent investigation and study.—O. L. Austin, Jr.

25. Bird/Wasp Nesting Associations. K. A. Hindwood. 1955. *Emu*, **55**(4): 263-274. This discussion of the tendency of certain species of birds to nest in association with such aggressive social insects as ants, bees, and wasps was prompted by the discovery that several small Australian bushwarblers and finches do so rather frequently. A survey of the literature and correspondence with observers abroad shows the practice to be world wide, but restricted chiefly to the tropics where such insects are more prevalent. The birds that do so are usually small ones, "largely species of inoffensive habits," and often communal nesters; many show a tendency to nest in trees or shrubs bearing thorns or spiny leaves, and most of them build covered or roofed nests. The evidence shows that in all such associations "the birds seek out the wasps' nests, not the wasps the birds' nests," the insects "tolerate the presence of the birds, yet show little or no forbearance towards human or other intruders," and "it does not seem that the wasps benefit in any way from the presence of the birds." The author believes the birds nest near the insects because of their "desire to be safeguarded from either mammals, reptiles or predatory birds." He suggests that the predisposition of both birds and insects to nest in the same trees and shrubs may have brought on the habit through proximity, but "the absence of any evidence that the habit has risen spontaneously . . . [indicates] a long period of evolution. Possibly the same point obtains in such remarkable practices as egg-parasitism and anting."—O. L. Austin, Jr.

BEHAVIOR

(See also Numbers 17, 21, 22, 24, 45, 52, 53)

26. Observations on the Voice and Some Displays of Certain Pigeons. Derek Goodwin. 1956. *Avicultural Magazine*, **62**(1, 2): 17-33; 62-70. Based on observations on 10 species of *Columba* and *Streptopelia* in freedom and captivity, and illustrated with many sketches, this paper is a significant contribution to the study of comparative behavior. "Display-plumage . . . occurs most commonly on the neck and upper breast. . . . These areas are always exhibited —by inflating the neck and erecting the display-plumage—in the bowing-display." "Parading" indicates sexual readiness. This behavior is combined with "Wing-lifting" in Stock and Rock Doves *(Columba oenas* and *livia)*, but not in those species under consideration that lack signal markings on the wings. As to the "display-flight," its function is "to advertise the presence of a bird in reproductive condition." It is strongly attractive to unpaired females and to lost and tired birds. "It sometimes seems . . . that in *C. livia*, as in man, lost or bewildered individuals have a tendency to follow any of their species who shows a self-assured and determined manner. Such behavior would be useful to them since it would ensure that, sooner or later, they would be led to an adequate feeding ground."

"Defensive-threat display" is shown by half-feathered nestlings and injured adults; the erection of feathers and wing indicates a conflict situation. "Voice" is discussed under 4 "basic calls"—advertising-coo, display-coo, distress-call, and excitement-call. The paper concludes with a brief discussion of phylogeny. —M. M. Nice.

27. "Anting" by House Sparrow. A. M. Common. 1956. *British Birds*, **49**(4): 155. A male *Passer domesticus* in mid-August was seen "picking up ants, then rubbing them under its wing and tail with its beak." The editors know of no previously published record of anting by this species.—M. M. Nice.

28. Further Experiments with an Artificial Nestling Gape. Monica M. Betts. 1956. *British Birds*, **49**(6): 213-215. A simplification of the method described in 1954 for procuring samples of food brought to nestlings, whereby the gape is used outside an ordinary nest box. Differences were found in the foods brought to nests in pine woods by three different species of titmice. As many as 20-200 small items are sometimes carried in one bundle!—M. M. Nice.

29. The Enigma of Bird Anting. H. R. Ivor. *National Geographic Magazine,* **110**(1): 105-119. A collection of remarkable photographs in color of birds anting. Mr. Ivor has seen more birds ant than anybody else in the world. In his observatory he has "watched upwards of 30 species of birds ant and seen thousands of individual antings." He describes the techniques of various species and discusses some of the theories advanced to explain this behavior. He finds it "puzzling that some birds ant frequently and others do so rarely. In nearly 18 years of observation, for example, I have seen the evening grosbeak and the cedar waxwing ant only once. In many ways it seems that anting is a primal form of behavior, lost by some birds but retained by others." The puzzle remains unsolved.—M. M. Nice.

30. Population Changes and Roosting Time of Starlings. David E. Davis. 1955. *Ecology,* **36**(3): 423-430. Roosting time of flocks of *Sturnus vulgaris* was noted at Baltimore, Md., on 281 dates from Dec. 19, 1950, to May 14, 1955. "The birds roosted about half an hour before sunset from November to March, at sunset in April, and almost an hour before sunset in July." Numbers of birds were highest in September, decreased in November, increased in January, and dropped to a low in June. This pattern was followed all three winters, but fewer birds were present in 1952-53. An extensive bibliography is appended.—M. M. Nice.

31. Communal Life of the Black Kite. (Über das gesellige Leben des Schwarzen Milans.) 1955. Nikolaus Langelott. *Die Vogelwelt,* **76**(4): 121-125. The Black Kite *(Milvus migrans),* which is ordinarily a solitary nester as far north as Germany, has developed colonies in particularly favorable locations near Frankfurt, one with 5 to 7 nests since 1950 and the other with 19 nests in 1955. Langelott suspects that the abundance of dead and sick fish has caused the nesting range of the Black Kite to spread up the Main River in the last two decades. Behavior notes of interest are: use of a joint flight play area, and use of joint roosts—up to 18 kites in a single roost tree, and the largest roost with 50 individuals sitting in close formations.—Frances Hamerstrom.

32. On the Depth to which our Waterbirds Dive. (Ueber die Tauchtiefern unsere Wasservögel.) Jakob Huber. 1956. *Der Ornithologische Beobachter,* **53**(1): 5-9. This is a report covering 25 years of observations on birds caught in nets, weirs, or on fishhooks at known depths in the Sempachersee. Relatively few birds were taken during this time. The results are summarized in the

Common Name	Scientific Name	Maximum Depth Taken, Meters
Red-throated Loon	*Colymbus stellatus*	24
Great-crested Grebe	*Podiceps cristatus*	23
Black-throated Diver	*Colymbus arcticus*	21
Velvet Scoter	*Melanitta fusca*	11

Data are also given for 11 other species taken at lesser depths. Unfortunately, the author does not indicate the depth of the lake so that we do not know how far from the bottom these birds were taken. In an editorial comment, Dr. E. Sutter reviews the paper by Schorger (*Wilson Bulletin,* **59**: 151-519) on the same subject.—R. O. Bender.

33. On the Hoarding Behavior of the Nutcracker. Zur Vorratsanlegung des Tannenhähers.) Urs Glutz von Blotzheim. 1956. *Der Ornithologische Beobachter,* **53**(2): 36-40. Nutcrackers *(Nucifraga caryocatactes)* are well known for their habit of storing nuts for use during the winter. The author observed Nutcrackers transporting nuts from an open northern-exposure mixed woodland to cache them in a thick southern-exposure spruce woods at least 2-4 km away across the Rhone valley. Several visits to the Aletschwald on the northern-exposure slope between December 31 and June 8 produced only three individual Nutcrackers and very few holes in the snow (50 cm to 1 m deep) characteristic of those made by Nutcrackers recovering their hoarded stores. The author suggests that the birds transported their winter food supplies to the southern exposure for greater ease in recovery during the winter. He says that, in the light of present knowledge

of Swiss Nutcrackers, this behavior seems to be exceptional and further studies will be required to determine whether it represents a phenomenon attendant to a pronounced place attachment or results from a learning process by this particular population. In Sweden these birds stay permanently within a limited area and are presumed to use their familiarity with the area in finding the storehouses under deep snow. The author also discusses the possibility that the few birds found in the Aletschwald during the winter were birds of the year, not too familiar with their territories, because the absence of shells or husks around the holes they had dug in the snow indicated that they apparently did not uncover caches of nuts. He also discusses the behavior of these birds in removing seeds from cones. This is a very interesting paper.—R. O. Bender.

CONSERVATION

34. Predation and Protection at Dungeness Bird Reserve. H. E. Axell. 1956. *British Birds*, **49**(6): 193-212. From 1939 to 1952 the gull and tern colonies of this Kentish Reserve suffered from disturbance by the Army and predation by people, Carrion Crows *(Corvus corone)*, hedgehogs and foxes. The hunting techniques of the crows are discussed, and methods of control of predation described. Numbers of breeding pairs of eight species of birds, and numbers of clutches laid and hatched by Common and Little Terns *(Sterna hirundo* and *S. albifrons)*, are given from 1952 to 1955.—M. M. Nice.

ZOOGEOGRAPHY
(See also Number 9)

35. Birds of the Chicago Region. Edward R. Ford. 1956. Chicago Academy of Sciences Special Publication No. 12, pp. 117, price $1.50. This long-awaited work brings up to date the earlier edition under the authorship of Ford, Sanborn, and Coursen. The addition of further sources of information, supplementing records of actual specimens in museums and private collections, greatly increases the value of the work as an expression of regional bird life. These sources are the records of local bird clubs, bird-banders, and particularly the quantitative field notes for Lincoln Park that William Dreuth kept meticulously for years. This is a concession to the elevated plane sight records have achieved in the present era of excellent field guides and optical equipment, even though it is still recognized that records based on actual specimens must be considered more concrete. Among added features is a better system of estimating relative abundance of species at each locality, pin-pointed by county. A few users observe that the additional information makes it more difficult to find arrival and departure dates than in the old edition, but this is not a serious fault and was unavoidable. It appears that no effort was spared to make the list as useful as possible. It is a fitting tribute to the devotion of Ed Ford, an inspiring friend of my early days.—William J. Beecher.

36. Dynamics of Range Expansion of Cattle Egrets in Florida. 1956. Dale W. Rice. *Auk*, **73**(2): 259-266. The author reports his observations of *Bulbulcus i. ibis* in a rookery on the campus of the University of Florida. The species first appeared in the mixed heron, ibis, water turkey rookery in 1954. This represented a 180-mile northward extension of its previously known breeding occurrence. Several individuals were seen in the pre-nesting period. The total population at the close of the breeding season was 12; 10 individuals appeared in 1955. Observations were terminated prior to the conclusion of this breeding season.

The source of these birds is reasonably assumed to the Lake Okeechobee region of Florida, where the species is presently flourishing. Rice discounts random wandering of adults as an explanation for the establishment of the new colony. On the basis of his observations establishment of the colony by wandering juvenals does not seem likely. The author concludes that the Cattle Egrets became mixed with local herons on their wintering grounds in southern Florida and accompanied them when they returned north to breed. Rice suggests that the successful establishment of the species in Florida is directly related to the

expansion of the cattle industry in the state. The successful establishment of the Gainesville colony with an initial introduction of only seven individuals is explained as resulting from interspecific reactions to social stimuli. The author proposes that, if other species had not been present, a minimum of 10 pairs would have been necessary for success. This latter conclusion appears to be based upon an account of the species in South Africa where it is reported to nest in colonies containing from 10 to 2,000 nests. The habit of associating with other species of herons is thus proposed as having survival value in facilitating dispersal and establishment.—J. C. Dickinson, Jr.

37. Short Notes and Observations from Central Pyrenees. (Brèves notes d'observation dans les Pyrénées centrales.) Yves Boudoint and Marc Laferrère. 1955. *Alauda,* **23**(3): 172-181. This is an annotated list of birds seen during a trip through the Valley of Neste l'Aure to the boundaries of the Resérve Botanique du Néouvielle. In all 52 species were seen of which 14 were raptors, including 4 species of vultures (Aegypiidae). Signs of Ptarmigan *(Lagopus mutus)* were found at elevations of 2,560 metres.—Louise de K. Lawrence.

38. List of Tunisian Birds. (Inventaire des Oiseaux de Tunésie (Appendum).) Georges Gouttenoire. 1955. *Alauda,* **23**(3): 217-218. Proof of nesting of the Shelduck *(Tadorna tadorna)* found 19 June 1955 at Lake Kelbia in the discovery of 4 adults and 18 ducklings. This was apparently two broods 1 and 3 weeks of age, as indicated by three collected birds. On 14 July about 20 Ruffs *(Philomachus pugnax)* were encountered in the same locality. One of the birds which was collected proved to be a young of the year in very fresh plumage. Although this find may not be considered certain evidence of nesting, the presence of this juvenile nearly a month and a half earlier than the fall migration of the species begins on this latitude is worthy of notice. Numerous other birds seen at the same time, such as Glossy Ibis *(Plegadis falcinellus),* Curlews *(Numenius arquata),* Black-tailed Godwits *(Limosa limosa),* were presumably all non-breeding individuals.—Louise de K. Lawrence.

39. Census of the Rouzic Island Birds April 1955. (Dénombrement des Oiseaux de l'Ile Rouzic (Sept-Iles) en Avril 1955.) Ph. Milon. 1956. *Alauda,* **24**(1): 37-48. The author secured permission to conduct his first bird count on this protected island in 1950. The data of his 1955 survey are based on meticulous methods of counting and observation, described in detail and well worthy of note by anyone interested in similar research. Comparison of the results of the two counts brought out many interesting changes. The Gannet *(Sula bassana)* increase of 550 percent was due partly, it is thought, to the immigration to the island of birds hatched elsewhere, but the increases in Shags *(Phalacrocorax aristotelis)* and Herring Gulls *(Larus argentatus),* 58 percent in each, might well have developed from the previously existing populations. The Great Black-backed Gull *(Larus marinus)* population remained stationary, but 100 pairs of Kittiwakes *(Rissa tridactyla)* were present in 1955 where none were seen in 1950. Most advanced in their nesting cycle at the time of the census (April 11-15) were the Gannets with most pairs already incubating. The Laridae were just establishing themselves on their territories and preyed extensively on the eggs of the Gannets and Shags, while the Alcidae were not yet present in full numbers. One Bridled Guillemot *(Uria aalge intermedia)* was observed.—Louise de K. Lawrence.

40. Notes on the Birdlife in the Jura Mountains. (Notes d'Ornithologie Jurassienne.) Paul Géroudet and Paul Barruel. 1956. *Alauda,* **24**(2): 81-96. This is a descriptive paper on the avifauna of the Juras, which appear to have been little explored hitherto. The observations were made during excursions in the spring and early summer 1955. A list is given of the species which furnished the most interesting observations, illustrated by a few excellent pen drawings. It includes grebes, herons, ducks, coots, and shorebirds found principally in the region of Lake Remoray. There is also a table on the species found at various elevations, giving their abundance as well as their status as breeding birds or visitors. The less common birds encountered ranged from the Short-toed Eagle *(Circaëtus gallicus)* to the Pygmy Owl *(Glaucidium passerinum),* from the Rock Thrush *(Monticola saxatilis)* to the Fieldfare

(Turdus pilaris). The three nesting colonies found of the latter are the most westerly known breeding grounds of the Fieldfare in Europe.—Louise de K. Lawrence.

41. The Occurrences in France of the White-winged Tern. (Les apparitions en France de la Guifette leucoptère *(Chlidonias leucopterus* (Tem.).) Georges Guichard. 1956. *Alauda*, **24**(2): 139-144. This review traces the breeding-grounds of the White-winged Tern from eastern central Russia, through central Siberia, to Sakhalin Island and its wintering grounds from the northern coasts of Australia, the Malayan States, India, to East Africa. Its occasional appearances in France in spring have been of single birds in the company of Whiskered and Black Terns *(C. hybrida and C. niger)* which naturally enough attract vagrant *leucopterus*. But it still remains for the hopeful ornithologist to observe and prove its nesting in France.—Louise de K. Lawrence.

42. The Avifauna of Newly Created Polders. (Die Vogelwelt der neuen Köge.) 1955. Dietrich König. *Die Vogelwelt*, **76**(2): 41-53. Progressive changes in avian use of coastland after diking and conversion to agriculture show a marked increase in numbers of species breeding. Species are listed for stages of agricultural succession.—Frances Hamerstrom.

43. Notes on the Distribution of the Goshawk in the Eastern Palearctic. (Bemerkungen über die Verbreitung der Hühnerhabichte in der Ostpaläarktis.) 1955. G. P. Dementiev. *Die Vogelwelt*, **76**(5): 161-164. Examination of 750 skins from Russian museums leads Dementiev to conclude that more work on breeding ranges and movements of Goshawk subspecies is urgently needed. Old Central European Goshawks tend to "imitate" the plumage of those from farther North.—Frances Hamerstrom.

PHYSIOLOGY

44. The Natural Termination of the Refractory Period in the White-Crowned Sparrow. D. S. Farner and L. R. Mewaldt. 1955. *Condor*, **57**(2): 112-116. On the basis of experiments showing increases in testicular weights and tubular diameters in response to 15-hour daily photoperiods, the authors conclude that the refractory period in male White-Crowned Sparrows *(Zonotrichia leucophrys gambelli)* reaches its termination in the vicinity of Pullmann, Washington during the last 2 weeks in October and the first week in November. Some individual variation was noted. No essential differences were observed between the reaction of first-year and adult birds. Variable molts were usually induced in both refractory and nonrefractory individuals.—J. C. Dickinson, Jr.

45. Temperatures during the Development of Birds in Arctic Nests. Laurence Irving and John Krog. 1956. *Physiological Zoology*, **29**(3): 195-305. Nest temperatures recorded during incubation in seven species of birds at Anaktuvuk Pass, Alaska (lat. 68°19′ N.) are within the same ranges as those for similar species in temperate climates. "The embryos develop in essentially a homoiothermous state maintained by the well-regulated behavior of their parents during incubation. . . . the temperature maintained in nests by parental behavior does not vary in relation to weather and is not visibly related to climate." This continues through the nestling period while "the young birds warm from the temperature of incubation to approach adult body temperature when they leave the nest. Growth proceeds at temperatures which are actually more stable than in the bodies of adult birds."

Though the nestling stage in Fringillids appears to be about 10 percent shorter in high latitudes than in temperate regions, "It has not been shown that brooding temperature affects the shortened arctic period of nestling life. In comparison with the circumstances of growth in temperate regions, prolongation of arctic daylight or daily feeding is much greater than the reported shortening of arctic nest life." The authors conclude "The stable, warm temperature for early avian development is common to all climates, and it is maintained through an equally common prescription for temperature regulation by parental behavior."—O. L. Austin, Jr.

FOOD
(See also Numbers 20, 21, 22, 28, 31, 33)

46. Food Habits of the King Rail in the Arkansas Rice Fields. Brooke Meanly. 1956. *Auk*, **73**(2): 252-258. Field observation and the analysis of 118 gizzards provide the basis for this study. During the cooler months the rails were observed to feed in the network of rice-field canals and natural drainage. The birds moved into the rice fields during the summer. Of the food taken 79 percent (volume) was animal. Crayfish were the principal item of animal food while cultivated rice seeds were the dominant plant item.—J. C. Dickinson, Jr.

PLUMAGES AND MOLTS
(See also Number 44)

47. Albinism Related to Age. R. M. Band. 1956. *British Birds*, **49**(4): 153-154. An adult male Blackbird *(Turdus merula)* in normal plumage was trapped in November 1950 and in the following springs and summers until 1954. In October 1955 its head was completely bald and there were flecks of white over most of its plumage. In December its moult had been completed; "there were considerable patches of white over most of its plumage, particularly the head."—M. M. Nice.

48. Contribution to the Embryonic Ptilosis of Some Passerines. (Beitrag zur embryonalen Pterylose einiger Nesthocker.) D. Burkhardt. 1954. *Revue Suisse de Zoologie*, **61**(4): 551-633. A detailed study, illustrated with many sketches and including 16 tables and 4 pages of bibliography. Table 13 shows in regard to 44 orders and families whether chicks are precocial or altricial, and whether they hatch with ample down, sparse down, or no down at all. Table 14 lists the presence or absence of down in many genera of parrots and passerines, while table 15 specifies the tracts in which down is present in 130 species. The number and position of the neossoptiles vary from species to species and even within a species. An admirable contribution.—M. M. Nice.

PARASITES AND DISEASES

49. A Pox Virus of the Slate-Colored Junco. C. Brooke Worth. 1956. *Auk*, **73**(2): 230-234. This paper reports a demonstration of the viral etiology of "foot-disease" in *Junco hyemalis*.—J. C. Dickinson, Jr.

SONG
(See also Number 26)

50. The Monotony-Threshold in Singing Birds. Charles Hartshorne. 1956. *Auk*, **73**(2): 176-192. The author comments, in conclusion, that his views may seem "anthropomorphic" (quotes his) to some readers. I am in complete agreement. Such phrases as "will avoid using," "if he is attending to what he is doing," "The bird avoids immediate repetition," "he hastens on," "Symptomatic of his concentration," "That a creature which is satisfied by small or poorly defined contrasts *within* its basic song-pattern will feel less need of variation," "and avoided repeating," abound. An abundance of objective data are treated to subjective interpretation from which the author concludes that "Song-development exhibits a trend toward unity in variety, i.e., beauty, which is to be expected if human nature is a further unfolding of tendencies pervading all life." All of the foregoing comes about as a result of the deduction that a bird which sings the same song over and over will have marked pauses between outbursts, while more versatile songsters will sing without pauses. The author adequately documents his obervations that birds with a limited repertoire do pause between songs for longer periods than do those which have less limited abilities.—J. C. Dickinson, Jr.

51. Variation In Carolina Wren Songs. Donald J. Boror. 1956. *Auk*, **73**(2): 211-229. The use of the tape recorder and its ally the audiospectrograph is beginning to open another apect of avian biology to solid documentation. No longer does the lack of "perfect pitch" necessarily hamper the investigator. Bird song today may be studied by a deaf-mute. The author analyses 71 song series and discusses (and pictures) singing behavior, song length, types of notes, frequencies and patterns of song. Of interest is the fact that Florida birds have a higher singing rate than Ohio birds. The songs of Florida birds also average slightly longer than those recorded in Ohio. Ornithologists should look forward to seeing additional studies of this type.—J. C. Dickinson, Jr.

52. On the Song of the Linnet (*Carduelis cannabina* (L.)). H. Poulsen. 1954. *Dansk Ornitholgisk Forenings Tidsskrift*, **48**: 32-37. Two male Linnets, hand-raised from the age of a week and kept from hearing other birds, started to sing loudly in February; they sang alike but differently from wild birds. Their song was "much shorter, consisting of fewer notes uttered in a much slower rhythm. The pitch and the timbre seem to be innate but the rhythm and the melody are not innate; only one phrase—the crowing—is completely innate." After they had sung their innate song for about two months they were put together with a normal Linnet and a Canary, but after a month "they were still singing their innate song."—M. M. Nice.

53. Song Output of Unstimulated Skylark. Noble Rollin. 1956. *British Birds*, **49**(6): 218-221. The all-day singing of 2 male *Alauda arvensis* was recorded on the Inner Farne Island, Northumberland, on April 18 and 21, each bird having been the sole singing Skylark at the time and thus unstimulated by territorial rivals. The first bird sang for a total of 4½ minutes, the other for 46 minutes. The author compares these figures with results he obtained on another Skylark: 68½ minutes in April, 47 in May, and 181 in July.—M. M. Nice.

BOOKS AND MONOGRAPHS

54. The Migration of Birds. (Les Migrations des Oiseaux.) Jean Dorst. 1956. Payot, Paris. 419 pp., 94 text figs. 1500 francs. This is a gratifyingly comprehensive and up-to-date survey covering all the important aspects of bird migration. Here are the chapter headings: Ancient explanations of bird migration; Methods of studying migration (contains an interesting account of major European banding programs); Migration in Europe and Western Asia; in North America; in the Australian region; in the intertropical region; of sea birds; Mechanics of migration; Bird invasions; Hibernation in birds; Physiological regulation of the migratory impulse; Orientation problems in migrant birds; Origin and Evolution of Migrations.

The author has brought a vast amount of material together within the covers of a single book, and has balanced his coverage nicely. As comprehensive a survey as this cannot possibly be exhaustive in all aspects of so vast a subject, and specialists are certain to find the treatment of their own particular fields skimpy in spots, and will be able to point out flaws and errors. I find a number of inaccuracies, for instance, in the accounts of the migrations of the Arctic and Common Terns. (Perhaps I read those pages hypercritically because Dorst overlooked my maiden paper on the Arctic Tern (Bull. N.B.B.A., 1928: 121) though he is not the first to ignore it.)

These petty faults detract very little from the book's general usefulness. Each chapter contains a helpful, if not exhaustive, bibliography for those who wish to pursue the subject further and to consult original sources, and the many maps and diagrams throughout the text enliven it considerably. Even for those who do not read French, this is one of the best source books of general information on migration yet published.—O. L. Austin, Jr.

55. Bird and Butterfly Mysteries. Bernard Acworth. 1956. Philosophical Library, Inc., New York. 303 pp., $7.50. This extraordinary book, subtitled "The Truth about Migration," is the work of a retired Royal Navy officer who is credited in the publisher's blurb on the dust jacket with having an "inquiring

and highly original mind." Original may not be the proper word, for in the course of his incredible dissertations the author not only proves to his own satisfaction that all evolutionists from Darwin on are in error, but also casts grave doubts on Einstein's theory of relativity and characterizes Newton as "something very near a charlatan."

Part I of the book deals with bird migration. Evidently a partly re-written version of an earlier book, *This Bondage*, published in 1929, it includes no references to work of the past 25 years except for a few notes of observations which seem to support the author's ideas. Much space is used to refute statements made by "distinguished ornithologists" who refused to take the author's theories seriously in 1927 and 1928. These include an "anonymous but presumably authoritative writer" who contributed an article to the London *Times*.

In his discussion of bird flight Acworth starts with the fact, which has sometimes been ignored by ornithologists, that the path of a bird flying over the earth's surface is the resultant of the bird's motion through the air and the movement of the air in which it is flying. On this firm foundation he builds an unbalanced, illogical structure, bound together by chains of circular reasoning and propped up by fallacious assumptions, which purports to "prove" a great many things about bird flight and bird migration which are not borne out by observation. The kindest possible appraisal of Captain Acworth's theories of migration is that they might be true if birds acted in the way he thinks they do and if they flew in an atmosphere in which there was no turbulence and in which the only winds were the prevailing winds of the climatic charts. But his theories do not hold in the imperfect real world in which ornithologists must work.

Part II is a detailed restating of the author's preposterous thesis that cuckoos are hybrids between the male cuckoo and the female foster parent, which he still maintains stoutly despite all evidence to the contrary. Part III on "Butterfly Migrations and other Phenomena" I had neither the time nor inclination to read.—William H. Allen.

NOTES AND NEWS

The 1956 volume (208 pages) was the longest since 1949, and we hope to make 1957 longer yet. A modest but steady rise in our circulation makes an increase financially possible, provided we can get enough good papers. Though a number of such papers have been received in recent months, we can still offer early publication.

The April issue will contain a very long paper on the Arctic Tern by Dr. Oscar Hawksley, who worked with the species at Machias Seal Island, off the coast of Maine.

The annual meeting of the Northeastern Bird-Banding Association, held on September 29, 1956, at Drumlin Farm in South Lincoln, Mass., was highly successful, with an attendance of over 90, including many newer banders. It is probable that the 1957 meeting will also be held there, as the facilities are outstanding and the location will be even more convenient after the Massachusetts Turnpike is opened.

Readers are reminded that the Association is now selling Japanese mist nets. For details, write to E. Alexander Bergstrom, 37 Old Brook Road, West Hartford 7, Conn.

BIRD-BANDING

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Published quarterly for:

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